PEMBINA institute

Pembina Institute's comments on the Clean, Efficient Buildings Intentions Paper

August 7, 2018

Summary

B.C. should adopt a target for carbon pollution from B.C. buildings to be reduced by 50% to 60% by 2030, as suggested by the Climate Leadership Team and the Climate Solutions and Clean Growth Advisory Council. Carbon pollution from buildings should also be nearly eliminated by 2050. To meet these goals, the province must ensure new buildings are efficient and heated by low-carbon fuels, like renewable electricity, renewable natural gas, or renewable district energy systems. It will also need to design a retrofit strategy to upgrade and/or electrify 30,000 houses, 17,000 apartment units, and 3 million square feet of commercial space — every year between now and 2050.

Making our homes and workplaces healthy, safe and affordable is the next mega-project for B.C. Meeting these goals will require private and public investment of up to $1 billion per year. It would also create over 10,000 sustainable jobs across the province and generate $4-8 billion in GDP growth.

The buildings intention paper is a positive start in that direction. It identifies the key public policies needed to facilitate this low-carbon transition, and asks the right questions. But to succeed, these policies will need to be integrated into a comprehensive low-carbon building strategy for new and existing buildings, supported by a labour strategy, and backed by significant public and private investments.

A comprehensive low-carbon building strategy should include:

1. A strategy to ensure a swift transition to low-carbon construction for new buildings, including:
a. A proactive vision for industry readiness: most builders in B.C. are able to deliver net-zero energy ready building by 2025
b. A regulatory backstop: a requirement for net-zero ready building code by 2032, with interim increments based on the Energy Step Code
c. A low-carbon first approach to fuel selection: provide regulatory and financial incentives for new buildings to use low-carbon heating systems

d. A market transformation strategy: grow capacity for low-carbon net-zero ready buildings today through training, incentives, and financing
e. Measures to ensuring buildings perform as intended: commissioning, recommissioning, and energy use disclosure requirements

2. A retrofit strategy that achieves carbon reductions and addresses seismic and fire liabilities at the pace and scale needed to meet targets, including:
a. A dedicated source of public capital for loans and grants programs
b. Low-barrier financing mechanisms to address procurement barriers and reduce lending risk (local improvements charges, on-bill financing, etc.)
c. Training and certification for retrofit contractors, particularly in the residential heating, ventilation and air conditioning (HVAC) installation industry
d. Equipment performance standards to ensure components are replaced by high-performance alternatives at end of life
e. A regulatory framework pairing labelling requirements and code requirements that puts all buildings on a staged retrofit plan

This submission includes 37 recommendations to inform the development of the Clean Growth Strategy and Budget 2019. A summary of all recommendations is included in Appendix 1.

Introduction

We support the recommendations made by the Climate Leadership Team[1] and the Climate Solutions and Clean Growth Advisory Council[2] to adopt a target to reduce carbon pollution from buildings by 50% to 60% below 2007 levels by 2030. If we are to meet an economy-wide reduction of 80% by 2050, we should also set a target for B.C.'s building to be near-zero emissions by 2050. The Clean Growth Strategy should chart a course to meet these two targets, and resources to ensure prompt implementation should be allocated in Budget 2019.

To meet these goals, we will need to upgrade and/or electrify 30,000 houses, 17,000 apartment units, and 3 million square feet of commercial space — every year between now and 2050.[3] We will also need to ensure new buildings are efficient and heated by low-carbon fuels, like renewable electricity, renewable natural gas, or renewable district energy systems. The scale of this effort should not be understated; meeting these goals would require private and public investment of up to $1 billion per year. It would also create over 10,000 sustainable jobs across the province and generate $4-8 billion in GDP growth.[4]

Many of our older buildings also require seismic and fire safety upgrades, and could be better prepared for heat waves and other extreme weather events caused by man-made climate change. It will be cheaper in the long run to combine these interventions, where it makes sense,

into comprehensive 'deep resiliency' retrofits addressing energy, seismic, fire, and climate adaptation.

This transformation is happening amidst a housing crisis, in the middle of a construction boom, and in the face of a looming skilled labour shortage, all of which add complexity and urgency to the situation. Growing and retooling our skilled labour force will be central to meeting provincial objectives and ensuring the viability of the industry. B.C. is fortunate to already have a sophisticated green building sector, which provides expertise for markets in B.C. and across the world. It attracts and retains some of our most dynamic minds. Prefabrication, automation, and energy information systems will need to play a larger role in the construction sector to increase performance, reduce waste, and provide better working conditions. To unlock the retrofit market and facilitate a swift transition to net-zero energy ready for all new construction, most builders, contractors, and manufacturers in the province will need support to retool within a decade.

This is the next mega-project for B.C.: making our homes and workplaces healthy, safe and affordable, and preparing the construction industry for the challenges and opportunities of the twenty-first century.

The buildings intention paper is a positive start in that direction. It identifies the key public policies needed to facilitate this low-carbon transition, and asks the right questions. But to succeed, these policies will need to be integrated into a comprehensive low-carbon building strategy for new and existing buildings, supported by a labour strategy, and backed by significant public and private investments.

Below are what we see as the key components of a low-carbon buildings strategy. These were informed by the Pembina Institute's two Thought Leader Forums[5,6] and research on best practices from leading jurisdictions:[7,8,9,10,11,12,13]

1. A strategy to ensure a swift transition to low-carbon construction for new buildings, including:
    a. A proactive vision for industry readiness: most builders in B.C. are able to deliver net-zero energy ready building by 2025
    b. A regulatory backstop: a requirement for net-zero ready building code by 2032, with interim increments based on the Energy Step Code
    c. A low-carbon first approach to fuel selection: provide regulatory and financial incentives for new buildings to use low-carbon heating systems
    d. A market transformation strategy: grow capacity for low-carbon net-zero ready buildings today through training, incentives, and financing

e. Measures to ensuring buildings perform as intended: commissioning, recommissioning, and energy use disclosure requirements

2. A retrofit strategy that achieves carbon reductions and addresses seismic and fire liabilities at the pace and scale needed to meet targets, including:
   a. A dedicated source of public capital for loans and grants programs
   b. Low-barrier financing mechanisms to address procurement barriers and reduce lending risk (local improvements charges, on-bill financing, etc.)
   c. Training and certification for retrofit contractors, particularly in the residential heating, ventilation and air conditioning (HVAC) installation industry
   d. Equipment performance standards to ensure components are replaced by high-performance alternatives at end of life
   e. A regulatory framework pairing labelling requirements and code requirements that puts all buildings on a staged retrofit plan

These should be integrated with a **labour strategy** to address gaps in skilled trades and remove barriers to entry for Indigenous people, women, immigrants, and other populations under-represented in construction professions and ticketed trades. It should be coordinated with **local land use plans**, to prioritize transit-oriented development and provide guidance on the probability of site redevelopment. It should also be coordinated with the **energy roadmap** to ensure that utilities' investments in infrastructure and demand-side management are consistent with a low-carbon future.

Specific recommendations to support this low-carbon buildings strategy are articulated below, based on the five sections of the Clean, Efficient Buildings Intentions Paper. We also discuss further the labour strategy, public leadership, and the role of the utilities.

Energy labelling requirement

We support the general vision outlined in the energy labelling section of the Clean, Efficient Buildings Intentions Paper. Labelling raises energy literacy and awareness, and helps consumers make informed purchase decisions based, at least in part, on the home's energy performance and potential savings through retrofit. Our research[14] shows that the depth and quality of upgrades and code compliance improve with labelling. A universal labelling program will level the playing field for leaders in the housing sector by raising the minimums of accepted practice, which will accelerate market transformation to high performing buildings and market penetration of energy retrofits.

Labelling at time of sale and rental

The Pembina Institute supports the intention to disclose energy performance at the time of listing a home or a commercial space for sale or rent. The infographic in Figure 1 shows the impact of intervening at various points of administrative contact (at time of new construction; at point of renovation; and at point of sale) for homes in B.C. It clearly shows that focusing solely on education and incentives will miss the bulk of opportunity to reduce the emissions from B.C.'s built environment.

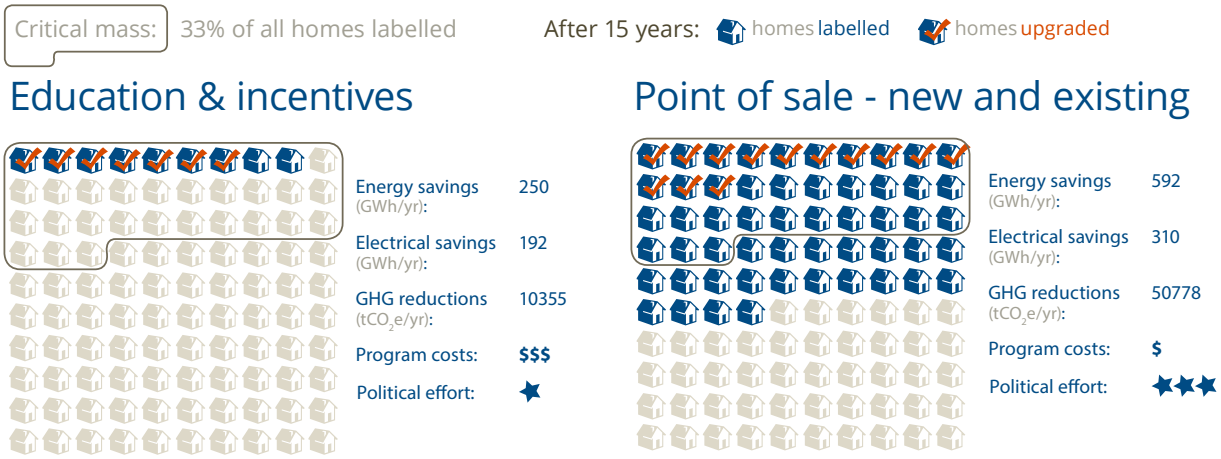

Figure 1. Benefits and costs of labelling policy tools. Point of sale disclosure has the potential to stimulate five times as many GHG reductions as education and incentives alone.

Source: Pembina Institute[15]

We estimate the labelling of homes at time of sale has the potential to reach more than 50% of B.C. houses and to reduce GHG emissions by 50,780 tCO_2e/yr within 15 years of implementation.

Recommendation

- Proceed with requirement for energy labelling at point of sale and rental for homes and buildings.

Labelling methodology

The intentions paper leaves open the question of what methodology should be used to create the labels. The nationally supported tools for diagnostic labelling are EnergyStar's Portfolio Manager for larger buildings and the EnerGuide Rating System for homes. Portfolio Manager provides a rating based on the operations of the buildings, while EnerGuide provides a rating based on the assets of the home (irrespective of how it is operated). These are two distinct

approaches to measuring energy performance, suited to different markets and purposes. Before launching a provincial energy label, it would be valuable to consider what attributes of these two approaches could be used across homes and buildings, and how other sources of data could be leveraged to increase the usefulness of the label and decrease its cost. B.C. should also consider how the platform can support the establishment of integrated retrofit contractors who can offer busy owners a one-stop shop solution.

The success of a universal labelling system will depend on its suitability to the B.C. context and the balance struck between accuracy, functionality and cost. For example, Scotland's Energy Performance Certificates are designed to be executed quickly and provide an overview, but the type of data collected can be useful in only a limited number of applications. At the other end of the spectrum, Natural Resource Canada's EnergyGuide Rating System requires significant data collection and validation, which adds to the costs. A labelling program must optimize the trade-offs between cost and accuracy based on the intended applications and audiences, and these will need to be carefully defined.

Recommendations

- Work with NRCan to review best options for a universal labelling methodology that leverages available data to reduce costs and that integrates with existing national systems.[16]
- Allow energy advisors to offer energy retrofit services and set up integrated one-stop retrofit businesses. Manage possible conflict of interests through QA/QC process and professionalization of the industry.

Annual benchmarking requirement

In addition to the point-of-sale requirement, the province should adopt annual benchmarking requirements for large buildings. Labelling at point of sale/rental is useful to ensure prospective owners and tenants have access to energy performance information, but annual benchmarking is a more effective tool to drive ongoing performance improvements. It provides owners with regular data to assess how their buildings perform compared to their peers and gives them an ongoing incentive to improve it.

Benchmarking requirements are already in place in three North American states and provinces (Ontario, Washington State, California) and 26 American counties and cities including Seattle, New York, Philadelphia, Chicago, and Austin.[17]

Benchmarking can provide data for feedback mechanisms to guide both code evolution, such as monitoring impacts of the Energy Step Code, and market evolution more generally. Also, benchmarking data can facilitate evaluation of energy efficiency for new and existing buildings and including this evaluation in building appraisals, which are evidence-based. Furthermore,

benchmarking has been shown to improve the business case for energy efficiency upgrades, accelerate uptake of high-performance enclosures, and drive economic development by stimulating investment in energy efficiency.

Recommendations

- Require benchmarking of energy performance for large buildings, starting with larger buildings first and including smaller ones over time. Phase in disclosure within two years.
- Consider how point-of-sale labelling and annual benchmarking can be integrated in a universal reporting system.

Data privacy issues

As we are envisioning how labelling systems can be used to collect, analyze, and share energy information, we should ensure that they also enable us to leverage the creativity and resources of our tech sector. Privacy concerns are currently an important barrier to collecting the basic information we need to know if the buildings we build perform as we intended them to. Such concerns also make it harder to use energy data for research, and for developing apps that can make it easier for owners and tenants to save energy and money. Consideration should be given to how data access and privacy concerns can be balanced to make building energy data available to research institutions and commercial parties to enable machine learning and use by consumer-facing applications. Machine learning can help identify energy savings opportunities, while apps can engage residents and users and change behaviour.

Recommendation

- Relax how privacy laws apply to energy data to facilitate data collection in multi-tenant buildings, enable machine-learning based research, and enable the use of energy data sets in apps for energy management and behavior change. Opening energy data would also support the innovation and growth goals of the #BCTech Strategy.

Stronger codes and standards

Clarifying next steps in the B.C. Building Code

We support the province's intention to increase energy efficiency requirements in the B.C. Building Code (BCBC) in three steps until 2032 when net-zero energy ready performance is reached. The two interim steps include making the code require 20% and 40% better energy efficiency by 2022 and 2027, respectively. For homes, this is equivalent to Step 3 and Step 4 of the BC Energy Step Code (ESC) (see Table 1).

This province-wide regulatory backstop provides clarity to the industry and consistency with the Energy Step Code. It is paramount that the province supports local governments that are adopting the ESC ahead of this schedule. This will ensure the bulk of designers, builders, and contractors in areas where most of the construction occurs are ready to deliver high-performance construction before these deadlines, and that local governments have the capacity to enforce these energy requirements.

We also support the province's intention to extend the ESC to cover a broader set of building types across all climate zones. In moderate climates such as that of the South Coast, we believe that costs are sufficiently low and industry capacity exists for multi-unit residential buildings to meet the requirements of Step 3 by 2022. We would recommend that these buildings follow an accelerated timeline.

Table 1. Equivalencies between the proposed B.C. Building Code efficiency increments and the BC Energy Step Code

Year	Improvement over BCBC-2012 r2	Homes	Multi-unit residential
2022	20% more efficient	Step 3	Step 2
2027	40% more efficient	Step 4	Step 3
2032	Net-zero energy ready	Step 5	Step 4

Recommendations

- Proceed with proposed extension of the BC Energy Step Code to new building types and climate zones and support its implementation, in preparation for future regulation.
- Target efficiency improvements aligned with Step 3 for multi-unit residential buildings in BCBC-2022 for climate zones 4 and 5.

Explicitly addressing carbon pollution

In order to provide an effective climate protection strategy, the province's code requirements should address not only energy efficiency, but also carbon pollution. At the moment, the B.C. Building Code is silent on carbon pollution, only setting targets for energy use and energy cost. The code references the U.S.-based standard ASHRAE 90.1, a prescriptive standard that also offers a performance-based compliance path and allows developers flexibility in their approach. Recognizing that not all energy sources are created equal and because the cost of a fuel is a good proxy for environmental impact in most of the U.S., the ASHRAE 90.1 standard uses energy cost to compare performance, rather than simply the quantity of energy used. This

assumption, however, does not work for the B.C. context where electricity is about three times more costly than gas although gas is 16 to 20 times more carbon intensive than electricity.[18] From an affordability perspective, the cost of heating with electricity can be comparable to that of heating with gas because heat pumps are several times more efficient.[19]

To encourage new buildings to connect to low-carbon heating sources, our energy code should compare the relative merits of different fuel uses based on their carbon intensity, rather than their energy costs. This should be done alongside requirements for energy efficiency, to limit energy waste and protect against future energy costs increases. If the province wishes to reduce carbon pollution, it must measure carbon pollution, and set clear carbon intensity limits for designers to work within. As Figure 2 illustrates, the capacity of the Energy Step Code to reduce carbon pollution is greatly tied to what fuel is used to heat the building; even if the efficiency increases, carbon pollution from new buildings will remain too high if the fuel mix remains the same.

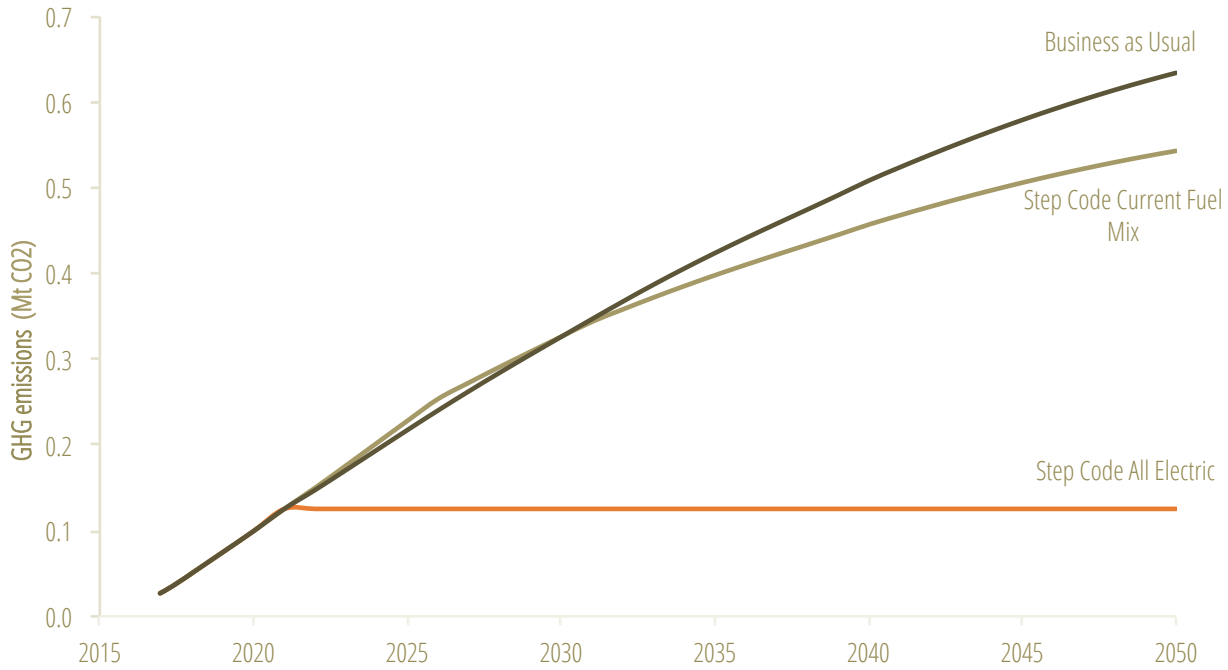

Figure 2. GHG emissions from new construction in B.C.

Created using BC Hydro PIE model and assuming the BC Energy Step Code is adopted by rapidly growing local governments at least two years ahead of the schedule outlined in Table 1.

In Figure 2, the different lines reflect the broad range of climate outcomes depending on what fuel is used, a decision left up to now to the discretion of builders. These projections show that even as efficiency increases, the choice of heating fuel dominates the emissions outcome of building operation. Maintaining the current fuel mix between natural gas and electrical heating would yield only a minor decrease in carbon pollution compared to current building practices.

There are plenty of low-carbon options to heat buildings, and regulations should be adjusted to send a clear signal to building designers that these are preferable. Setting a carbon intensity budget gives developers an incentive to connect to low-carbon heat sources (e.g. electricity, district energy systems, or renewable natural gas) while still providing the flexibility to use fossil natural gas and other carbon-intensive fuels for high-value uses like cooking or back-up heating systems. Carbon intensity limits are already in use in Canada by the City of Vancouver, the City of Toronto, and various third-party standards such as the Canada Green Building Council's Zero Carbon Building Standard, Architecture 2030's ZERO Code, and the International Living Future Institute's Zero Energy certification.

The simplest way to meet this objective would be to incorporate GHG intensity metrics into the Energy Step Code. This would help to ensure a consistent framework and approach across the province. The BC Energy Step Code Council could oversee the design to make sure it meets the needs of local governments and industry and could update the ESC guidelines accordingly. The province could then use the learnings from that process to consider the best way to incorporate the climate objective into the BCBC ahead of the 2022 revision. As a leading jurisdiction, B.C. should work with the federal government to incorporate carbon intensity metrics into the national model building codes as well. These steps will ensure that new construction does not lock in carbon intensive heating technologies.[20]

Recommendations

- Incorporate carbon emission intensity targets into the BC Energy Step Code as opt-in requirements for local governments.
- Work with the federal government to add climate mitigation and climate adaptation as explicit objectives of the national building codes, and start to include climate protection metrics in the 2022 B.C. Building Code.

Setting a proactive vision for new construction

The province's 2032 net-zero ready goal for the B.C. Building Code, combined with the interim targets discussed in the buildings intentions paper, provide a firm regulatory backstop for energy efficiency in new construction. However, most builders can, and should, be able to deliver net-zero ready performance much sooner.

In that spirit, it would be valuable for the province to partner with industry associations and partners such as the Zero Emissions Building Exchange (ZEBx) to collaborate on aspirational targets for market transformation, ensuring that B.C.'s designers, builders and trades have the skills and training to build to net-zero ready ahead of the 2032 deadline. These partnerships will also be central in delivering the capacity building measures outlined in the Training and

Certification section (see below), and should be integrated with a wider construction labour strategy.

Recommendation

- Work with industry associations, training institutions, and centres of excellence to set an aspirational target for most builders, designers, and trades to have completed a net-zero ready project by 2025.

Building code requirements for existing buildings

The majority of carbon pollution reductions in the building sector need to come from existing buildings. Incentives and financing programs will play a key enabling role, but we know that voluntary mechanisms alone are unlikely to meet our objectives, and that some requirements to upgrade buildings to increase their safety and reduce their pollution will be needed.

The province intends to adopt the upcoming federal model code for existing buildings (to be released in 2022) within two years, or by 2024. We support in principle the alignment of a provincial retrofit code with federal codes; however, there is inherent risk in waiting for the release of this model code. The stringency and scope of this model code is still unknown (particularly with regard to carbon objectives), as is the appropriateness of this code for the B.C. context.

There are early actions that the province can take to advance code development for existing buildings. These include piloting established retrofit codes such as ASHRAE 100, and working with local governments to improve compliance and prepare for enforcement of future regulations. To be successful, a retrofit code for existing buildings must also be integrated into a comprehensive retrofit strategy that includes incentives, financing, capacity building, and energy information. These pieces need to be coordinated to ensure owners get information on energy conservations measures, upcoming regulations, available incentives, and financing options at critical decision points in the life cycle of a building. For example, the province should require the depreciation reports conducted for the strata council of condominiums to include energy conservation options that could (or must) be included in the capital plan. These reports could also provide recommendations for cost-effective measures that need to be integrated in maintenance plans.

Recommendations

- Adopt a schedule of retrofit requirements at time of renovation based on ASHRAE 100 for large buildings and ASHRAE 90.1 for small buildings.

- Work with local governments to encourage enforcement of current energy codes at time of retrofit.
- Work with the federal government to ensure that robust carbon objectives, along with other priorities (seismic resilience, adaptability, fire protection), are included in a federal model code for existing buildings.
- Require depreciation reports to provide energy efficiency recommendations and information on upcoming regulations to inform strata council capital planning decisions.

Equipment performance standards

We support the province's intention to align in principle with the roadmap on equipment efficiency standards agreed upon at the 2017 conference of Energy and Mines Ministers.[21] The province's proposed schedule, which is a few years ahead of the federal roadmap, will require high-efficiency windows to be 30% more efficient by 2022 and 55% more efficient by 2035. It will also require that space and water heating equipment be greater than 100% efficient (using heat pump technology) by 2035. This shift in particular is a key enabler for a transition to a low-carbon building sector.

Successful implementation of low-carbon equipment regulations relies on driving up demand for these high-performance appliances today, and expanding training and certification programs for the proper installation of such equipment. The province can take action now to ensure that these standards are adopted successfully and on time.

Recommendations

- Proceed with proposed schedule for equipment efficiency standards, based on the aspirational targets set at the 2017 conference of Energy and Mines Ministers.
- Encourage the adoption of low-carbon heating equipment today through incentive programs and by adding greenhouse gas intensity targets in the Energy Step Code.

Commissioning

The role of building commissioning was not discussed in the intentions paper, yet commissioning by a certified commissioning agent is one of the most effective ways to encourage high-quality installations, to detect and correct errors early, and to ensure a smooth transition between builders and building operators.

Modern buildings have fairly complex building systems that require some tuning and troubleshooting in the early year(s) of operation. For this reason, commissioning has been a requirement for building certification programs such as LEED for many years and is becoming common practice across the industry. Requiring commissioning for all complex buildings would

support code compliance, protect owners, and help close the gap between as-designed and as-operated performance. The U.S. federal government and various state governments have commissioning requirements for their buildings; jurisdictions such as the City of Seattle[22] and the State of California[23] also have commissioning requirements for large buildings, which could be a blueprint for a B.C. policy. The City of Seattle also has a re-commissioning policy for existing buildings, requiring a building 'tune up' every five years.[24]

Some lighter form of commissioning should also be considered for homes, particularly to ensure that HVAC systems operate as they were intended (see section on Training and Certification).

Recommendations

- Introduce a commissioning requirements for complex buildings in the next revision of the B.C. Building Code.
- Support local governments in implementing recommissioning requirements for existing buildings. Seattle's 'building tune up' policy could be a blueprint.

EV-ready and solar-ready requirements

We support the province's intention to encourage building owners to install electric vehicle (EV) charging stations. This infrastructure should become mandatory in some cases, but must be considered alongside other investments to support alternate modes of transportation (such as transit or cycling) as part of a wider transportation strategy.

New buildings should also be prepared for a future increase in demand for distributed electricity generation; for example, by ensuring that electrical panels, wiring, and transformers are ready to accommodate rooftop solar power systems. The need for EV-ready requirements should be revisited after the energy roadmap discussions have clarified the role that building-attached renewables should play in increasing the resiliency of B.C.'s grid and growing the province's renewable energy supply.

Recommendation

- Develop, as part of the energy roadmap process, a detailed strategy for clean transportation and on-site renewables.

Financial incentives

We support the province's intention to accelerate market transformation for energy efficiency products through incentives and financing. However, we caution against short-term incentives

funded from general revenues, as their transience creates uncertainty and turbulence that are detrimental to the establishment of a prosperous energy efficiency market.

To be effective, provincial incentives must have longevity, and therefore funding that is separate from general revenue. B.C. could generate a sustainable source of capital by issuing green bonds, similarly to what Germany is doing in partnership with the KfW Development Bank. In this successful public–private partnership, the government sells bonds on capital markets to fund a mix of low-interest (1–3%) loans and grants which local retail banks can offer to their customers. The added economic activity from the investment have shown to return four to five times more funds to the public coffers than the program costs, which is more than sufficient to repay the bonds.[25]

Any provincial incentive program created to address climate change should ensure that it does not further contribute to technological lock-in, especially into carbon-based infrastructure. FortisBC offers a range of incentives to support uptake of high-efficiency gas furnaces and boilers. Provincial incentives should focus on market transformation for low-carbon heating systems, and should not incent the use of fossil-fuelled equipment.

Recommendations

- Develop a green bonds program to provide ongoing funding for grants and low-cost loans for energy and resiliency retrofits.
- Assess the potential for increased economic activity and public revenues resulting from these public investments.
- Focus provincial incentives for heating equipment on low-carbon technologies; avoid incentives that lock in carbon polluting technologies.

Financing mechanisms

Whether the capital is publicly funded through green bonds, or leverages capital from private investors, there are several models to structure loans to reduce barriers for owners and reduce risks for lenders. Tying the loan to the meter or to the property title can allow long-amortization loans to be transferred if the building is sold, thus reducing the risk of default, reducing monthly payments, and increasing borrowing capacity for owners. These models have facilitated billions of dollars in investment throughout North America[26], and should be considered in B.C. Low-barrier financing models tailored to specific market segments are a key enabler to establish a market for deep energy retrofits, and a necessary condition to the acceptability of code requirements for existing buildings.

Ontario, Nova Scotia and Alberta have passed legislation that enables local governments to use Local Improvement Charges (LICs) to provide energy efficiency financing programs for

homeowners. LIC-based retrofit pilot programs are currently underway in Toronto (Home Energy Loan Program)[27] and Halifax (Solar City)[28], and are in development in Edmonton and Calgary.

On-bill financing is another approach to investments in energy efficiency that allows homeowners to pay back loans through their utility bills. Manitoba has one of the longest running programs in North America (Pay-As-You-Save)[29] and the City of Nelson's utility hosts an on-bill financing program (EcoSave)[30]. Fourteen U.S. states have similar programs. [31]

In either cases, government-backed credit enhancements can help encourage third-party investors to extend their lending terms, reduce their lending rates, and/or offer loans to customers with credit ratings that are unlikely to qualify. Credit enhancements mobilize private capital by de-risking projects that are also not likely to attract private investment.

For commercial buildings, the Metered Energy Efficiency Transaction Structure (MEETS) invites investors to be "virtual tenants" who finance energy efficiency retrofits and are repaid the revenues from the energy saved, also known as negawatt-hours.[32] The revenues are determined based on the pre- and post-retrofit energy demand loads and distributed through energy efficiency power purchase agreements with the utility. The physical building tenants continue to pay pre-retrofit energy costs to the utility, and the utility pays the revenues to the investor.

Recommendations

- Work with local governments, financial institutions, and utilities to create a financing program using local improvement charges and/or on-bill financing to provide loans for energy, seismic, and fire retrofits. To improve the terms, the province should consider creating a loss-reserve fund, providing credit enhancement, or pairing the loans with grants. Increase the size of available loans and grants based on the level of carbon reductions expected.
- Work with Canada Mortgage and Housing Corporation and federal partners to harmonize rules across the country for LIC programs and remove barriers to applicants (e.g. requiring lender consent).
- Pilot the Metered Energy Efficiency Transaction Structure in a high-profile commercial building in B.C.

Low Carbon Buildings Innovation Program

The Pembina Institute supports the province's intent to provide financial support to manufacturers, builders, developers, and associations to accelerate innovation and market transformation for high-performance construction and deep energy retrofits.

Here are two international best practices approach which we believe should be adapted and implemented in B.C.

Innovation for high-performance new construction: Brussels' BatEx program

One successful example of an incentive and marketing program to accelerate innovation for high-performance new construction is the Belgian BatEx program[33]. The Better Buildings BC program is an ICE Fund pilot project currently in development that aims to replicate the approach taken by Brussels.[34]

The momentum generated by the BatEx program propelled Brussels from European laggard to world leader in seven years. The region went from having one of the worse building codes in Europe to adopting, in 2015, a building code requiring a level of performance close to the Passive House. For the B.C. program to be as catalytic, it will require multi-year commitment and collaboration with industry groups. Between 2007 and 2009, Brussels provided 18 million Euros (~ $30 million) in subsidies to support three calls for proposals resulting in 117 winning projects. That investment resulted in new construction and renovation of 265,000 m^2 to Passive House standards, including hundreds of homes, offices, schools and child care centres.

Recommendation

- Provide multi-year funding for the (soon to be launched) Better Building BC program, at a scale sufficient to showcase high-performance low-carbon buildings across a range of building types and regions.

Commercialization of deep retrofits: the Dutch EnergieSprong program

Achieving 50% to 60% reductions in carbon pollution by 2030 and reducing the seismic, fire and climate vulnerability of our buildings will require rapid innovation in the procurement and delivery of deep resiliency retrofits. Modernization and industrialization of the construction industry can decrease the costs of retrofits and new builds, and reduce labour pressures. Long-term cost savings in capital replacement can be achieved by integrating fire, seismic, and climate upgrades into "deep resiliency" retrofit packages. These integrated solutions can also be used to build new high-performance homes, quickly and affordably.

The provincial and federal governments' plan to invest billions in new and refurbished social housing in the next 10 years provide a unique opportunity to advance this innovation, and also some urgency: how do we use these funds most effectively to increase resiliency and eliminate carbon pollution from our social housing sector?

The Dutch Energiesprong program has demonstrated how this could be done. Working with industry, regulators, financiers, and housing societies, they catalyzed innovation in the supply chain by piloting new deep retrofit solutions, aggregating demand, and clearing a path to a sustainable business case. This has led to the retrofit of over 2,000 social housing dwellings to net-zero energy, with another 9,000 units contracted. Installation times have been cut from a few months to a few days, and costs reduced by 50%, over three years. Construction companies that have invested in developing these solutions are now using the same components to build new affordable housing that is net-zero energy.

Such an approach could be replicated in B.C. The Pembina Institute, BC Housing, the BC Non-Profit Housing Association, and the City of Vancouver have joined forces to adapt the model.[35] Commercialization of these solutions requires concurrent growth in demand and supply; both industry and building operators must realize the benefits. Regulations, procurement rules, financing terms, and warranty, insurance, and incentive programs will need to be aligned to make the business model work. A key challenge to fostering innovation in multi-stakeholder environments is that no one is responsible for changing the ecosystem to create new outcomes. Given the complexity of the retrofit ecosystem, this will not happen on its own. A trusted third party must have the mandate and resources to find a solution that works for all actors.

Recommendation

- Ensure upcoming provincial and federal investments in social housing retrofits are leveraged to accelerate commercialization of deep energy retrofits.

Training and certification

We support the province's intention to work with industry associations, unions, and educational institutions to improve training and certification in the building sector. Certification and quality control will help ensure that installations are done properly, performance targets are met, and buildings are operating as intended. Some key areas where our research has shown that more capacity and quality control are needed are discussed below.

Residential HVAC systems

A well-designed and properly installed HVAC system is key to ensuring proper ventilation and air quality, safety, and energy performance in buildings. However, despite its importance, the residential HVAC installation market in particular remains poorly regulated. While a ticketed tradesman might be required to perform a gas or electrical hookup, no training requirements are required to design, sell, or supply a residential HVAC system.[36]

The increased uptake of advanced HVAC equipment in high-performance buildings, such as heat recovery ventilators (HRVs) and heat pumps, will benefit from standardized training and quality assurance.

Recommendations

- Work with the federal government to create new trade accreditation programs for HVAC systems, for example through Red Seal certification for individuals or ACCA Residential Service & Installation certification for companies.
- Partner with industry groups to encourage the use of Quality Installation standards for HVAC systems, such as the ACCA 5 Standard.
- Work with local governments to improve permitting and inspection processes for HVAC systems (Kelowna and Burnaby's heating system permits could be a blueprint).

High-performance envelopes

Training and certification programs should be expanded to other building sector occupations, including the multiple trades that are involved with the construction of high-performance and airtight building envelopes. This is a key component of highly energy efficient construction, and will become increasingly prevalent as the BC Energy Step Code is adopted. High-performance building envelope construction must be approached with extra care and attention to detail, and involves specialized procedures such as air barrier testing.[37]

Recommendation

- Support training in energy efficient envelope construction, such as that being delivered by the BCIT High Performance Building Lab.

Accreditation for Certified Retrofit Professionals

We support the province's intention to establish accreditation(s) for Certified Retrofit Professionals. This could include multiple trade disciplines including HVAC, insulation and window fitting. We encourage the province and its partners to consider not only the proper application of these components, but also how they can be integrated over time in a whole-building phased retrofit approach targeting a low-carbon end goal. These certifications should eventually be required as a qualification for incentive programs, motivating contractors and suppliers to become certified.

Recommendation

- Develop an accreditation(s) for Certified Retrofit Professionals, and consider how such a program could support phased low-carbon retrofits.

Construction workforce strategy

The revitalization and decarbonization of B.C.'s building stock represents a tremendous opportunity to create local green jobs across the province. However, there are challenges that the province should consider.

B.C. is already in the midst of a shortage of skilled labour, and this issue is likely to be exacerbated by the aging demographics of the industry. Automation and prefabrication can address some of the labour pressures by increasing productivity and providing controlled work environments that are safer, more comfortable, and more accessible. A provincial construction labour strategy should also begin to address the issues of temporary employment and a lack of skills development in the industry. It should provide support for and access to training in trades for marginalized populations, in order to address equity gaps and increase the skilled labour workforce. Employment programs should be tailored to the needs of Indigenous peoples, both living on reserve and in urban areas. Regularizing migrant workers and providing them with training opportunities, and supporting women to enter the trades and design professions, could also strengthen the skilled labour pool and increase equity in the construction industry.

Recommendations

- Develop a construction labour strategy that addresses skilled labour gaps and equity issues in the building industry. Integrate with emerging technology and innovation strategy to foster greater use of automation and prefabrication.

Public sector leadership

The province plans to release a separate intentions paper in winter 2019 on the role of the public sector in the clean growth strategy. Public sector leadership will be crucial in catalyzing the transition to a low-carbon buildings sector.

Thus, the province should complement the Low Carbon Buildings Innovation Program with a renewed commitment to leadership by example in the public sector. This will require significant changes in procurement rules and practices, as the current 'lowest bid' model is a strong deterrent to innovation and presents significant barriers to public sector organizations'

abilities to demonstrate leadership. Bridging the split incentive between capital and operational budgets will also be key to enabling further investment in energy efficiency.

Recommendations

- Undertake a review of public procurement policies and encourage greater use of Integrated Project Delivery for complex projects.[38]
- Replace or amend the current LEED Gold requirement for public buildings to require upper levels of the Energy Step Code (the new BC Housing construction standards could be a blueprint).[39]
- Establish a rotating loan fund for public sector organizations to address the capital budgets vs. operating budgets split incentive.

The role of utilities

Utilities play an important role in delivering programs and planning for the energy systems of tomorrow. However, at present, there is a disconnect between our provincially legislated climate targets and the long-term demand forecasts used by our utilities to plan their infrastructure development. Neither of the two largest utilities in B.C. (BC Hydro and FortisBC) have developed a long-term plan that is aligned with provincial climate objectives.

The choice of fuels used to heat and power buildings is central to the transition to a low-carbon building stock; it is also central to the long-term demand forecast of utilities and infrastructure investment decisions it triggers. The energy roadmap component of the province's Clean Growth Strategy must provide a clearer path to align utility planning with our climate objectives, including projections of future demand for different heating fuels as B.C. moves to a low-carbon economy; an assessment of the role that ratepayer funded utility incentives play in this transition; and a discussion of the best structure to provide these incentives.

Conclusion

Cutting carbon pollution by more than half in about a decade and eliminating it in thirty years are bold objectives that require bold policies. Crafting public policies for the building sector is an art as much as a science, as it must combines both regulatory backstops and measures to encourage and enable the market to adopt high performance practices. Increasing the efficiency of our buildings and reducing their reliance on fossil fuels is a win-win-win proposition: it grows the economy, both at home and for exports; it creates good jobs where British Columbians live; and it will give us buildings that are safer, healthier, more durable, more resilient, and more comfortable.

We commend the province for giving stakeholders an opportunity to weight in on these key policy directions. Advancing the policies proposed in this intentions paper and the recommendations provided here would make B.C. a national leader in low-carbon building construction. We look forward to working with the ministries of housing and municipal affair; of energy and petroleum resources; of advanced education, skills & training; of citizens' services; of finance; and of environment and climate change in the next year to fill in the details and chart a course to meeting these objectives in a timely manner.

Appendix 1: List of recommendations

Labelling at time of sale and rental

1. Proceed with requirement for energy labelling at point of sale and rental for homes and buildings.
2. Work with NRCan to review best options for a universal labelling methodology that leverages available data to reduce costs and that integrates with existing national systems.
3. Allow energy advisors to offer energy retrofit services and set up integrated one-stop retrofit businesses. Manage possible conflict of interests through QA/QC process and professionalization of the industry.
4. Require benchmarking of energy performance for large buildings, starting with larger buildings first and including smaller ones over time. Phase in disclosure within two years.
5. Consider how point-of-sale labelling and annual benchmarking can be integrated in a universal reporting system.
6. Relax how privacy laws apply to energy data to facilitate data collection in multi-tenant buildings, enable machine-learning based research, and enable the use of energy data sets in apps for energy management and behavior change. Opening energy data would also support the innovation and growth goals of the #BCTech Strategy.

Stronger codes and standards

7. Proceed with proposed extension of the BC Energy Step Code to new building types and climate zones and support its implementation, in preparation for future regulation.
8. Target efficiency improvements aligned with Step 3 for multi-unit residential buildings in BCBC-2022 for climate zones 4 and 5.
9. Incorporate carbon emission intensity targets into the BC Energy Step Code as opt-in requirements for local governments.
10. Work with the federal government to add climate mitigation and climate adaptation as explicit objectives of the national building codes, and start to include climate protection metrics in the 2022 B.C. Building Code
11. Work with industry associations, training institutions, and centres of excellence to set an aspirational target for all builders, designers, and trades to have completed a net-zero ready project by 2025.
12. Adopt a schedule of retrofit requirements at time of renovation based on ASHRAE 100 for large buildings and ASHRAE 90.1 for small buildings.

13. Work with local governments to encourage enforcement of current energy codes at time of retrofit.
14. Work with the federal government to ensure that robust carbon objectives, along with other priorities (seismic resilience, adaptability, fire protection), are included in a federal model code for existing buildings.
15. Require depreciation reports to provide energy efficiency recommendations and information on upcoming regulations to inform strata council capital planning decisions.
16. Proceed with proposed schedule for equipment efficiency standards, based on the aspirational targets set at the 2017 conference of Energy and Mines Ministers.
17. Encourage the adoption of low-carbon heating equipment today through incentive programs and by adding greenhouse gas intensity targets in the Energy Step Code.
18. Introduce a commissioning requirements for complex buildings in the next revision of the B.C. Building Code.
19. Support local governments in implementing recommissioning requirements for existing buildings. Seattle's 'building tune up' policy could be a blueprint.
20. Develop, as part of the energy roadmap process, a detailed strategy for clean transportation and on-site renewables

Financial incentives

21. Develop a green bonds program to provide ongoing funding for grants and low-cost loans for energy and resiliency retrofits
22. Assess the potential for increased economic activity and public revenues resulting from these public investments
23. Focus provincial incentives for heating equipment on low-carbon technologies; avoid incentives that lock in carbon polluting technologies.
24. Work with local governments, financial institutions, and utilities to create a financing program using local improvement charges and/or on-bill financing to provide loans for energy, seismic, and fire retrofits. To improve the terms, the province should consider creating a loss-reserve fund, providing credit enhancement, or pairing the loans with grants. Increase the size of available loans and grants based on the level of carbon reductions expected.
25. Work with Canada Mortgage and Housing Corporation and federal partners to harmonize rules across the country for LIC programs and remove barriers to applicants (e.g. requiring lender consent).
26. Pilot the Metered Energy Efficiency Transaction Structure in a high-profile commercial building in B.C.

Low Carbon Buildings Innovation Program

27. Provide multi-year funding for the (soon to be launched) Better Building BC program, at a scale sufficient to showcase high-performance low-carbon buildings across a range of building types and regions.
28. Ensure upcoming provincial and federal investments in social housing retrofits are leveraged to accelerate commercialization of deep energy retrofits.

Training and certification

29. Work with the federal government to create new trade accreditation programs for HVAC systems, for example through Red Seal certification for individuals or ACCA Residential Service & Installation certification for companies.
30. Partner with industry groups to encourage the use of Quality Installation standards for HVAC systems, such as the ACCA 5 Standard.
31. Work with local governments to improve permitting and inspection processes for HVAC systems (Kelowna and Burnaby's heating system permits could be a blueprint).
32. Support training in energy efficient envelope construction, such as that being delivered by the BCIT High Performance Building Lab
33. Develop an accreditation(s) for Certified Retrofit Professionals, and consider how such a program could support phased low-carbon retrofits

Construction workforce strategy

34. Develop a construction labour strategy that addresses skilled labour gaps and equity issues in the building industry. Integrate with emerging technology and innovation strategy to foster greater use of automation and prefabrication.

Public sector leadership

35. Undertake a review of public procurement policies and encourage greater use of Integrated Project Delivery for complex projects.
36. Replace or amend the current LEED Gold requirement for public buildings to require upper levels of the Energy Step Code (the new BC Housing construction standards could be a blueprint)
37. Establish a rotating loan fund for public sector organizations to address the capital budgets vs. operating budgets split incentive.

Endnotes

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