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Key elements of a retrofit strategy for B.C.

Results from the November 2016 Thought Leader Forum

Tom-Pierre Frappé-Sénéclauze, Dylan Heerema, Karen Tam Wu

April 2017

Photo: David Dodge, Green Energy Future

Pathways to NET-ZERO BUILDINGS

real estate foundation BRITISH COLUMBIA

PEMBINA institute

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Pathways to Net-Zero Buildings in B.C.

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Production management: Stephen Hui
Editor: Roberta Franchuk
Cover photo: David Dodge, Green Energy Futures

Recommended citation: Frappé-Sénéclauze, Tom-Pierre, Dylan Heerema, Karen Tam Wu. *Deep emissions reduction in the existing building stock: Key elements of a retrofit strategy for B.C.*. The Pembina Institute, 2017.

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Acknowledgements

The Pembina Institute wishes to thank TD and the Real Estate Foundation of B.C. for partnering with us to prepare and host this dialogue.

We would also like to thank BC Hydro, Sitka Foundation, Tides Canada, Ivey Foundation, Natural Resources Canada, MEC, North Growth Foundation and The Atmospheric Fund for their generous support of the 2016 Thought Leader Forum.

The authors would also like to thanks the external reviewers who have provided feedback on a draft of this report:

Katherine King, BC Hydro
Christina Bollo, UBC
Peter Sundberg, City Green Solutions
Brendan McEwan, City of Richmond
Jarrett Hutchinson, Government of B.C.
Donna Sanford, Government of B.C.

Executive summary

The Pembina Institute hosted the Pathways to Net-Zero Thought Leader Forum in November 2016. We brought together over 120 participants from across the building sector to establish recommendations for a national and provincial building retrofit strategy. Over two days, we discussed strategies to accelerate retrofit uptake in one- and two-family homes, multi-unit residential buildings (MURBs), and commercial-institutional buildings.

Given the breadth of topic covered, we did not attempt to reach consensus; the recommendations below do not necessarily represent the views of all participants.

Targets

We propose that the building sector should aim to reduce greenhouse gas emissions from the operation of buildings by **40-50%** below 2007 levels by 2030, and **80-100%** by 2050. In absolute terms, this means on-site emissions and upstream emissions related to electricity generation should be brought down to ~4 $MtCO_2e$ by 2030, and below 1.5 $MtCO_2e$ by 2050.

Modelling shows that measures announced in B.C.'s 2016 Climate Leadership Plan will not be sufficient to meet B.C.'s legislated economy-wide emissions reduction targets (Figure 1). Some of the policies proposed in the Plan, such as the commitment for building codes to require net-zero ready buildings by 2032, will help reduce emissions in the building sector, but they are insufficient to meet the proposed building sector targets (Figure 2). Additional policies are needed to reduce emissions, particularly from existing buildings.

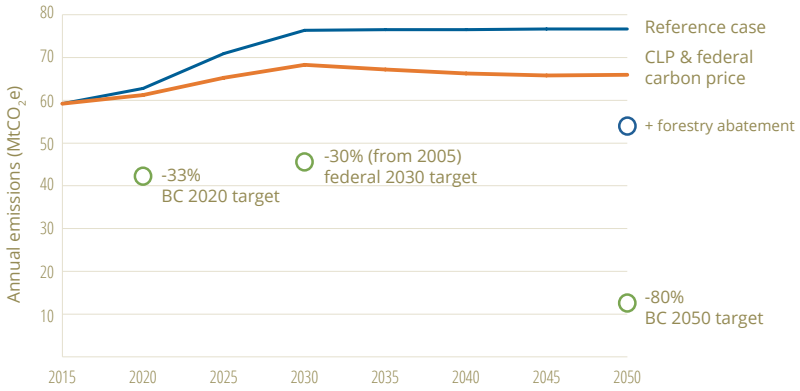

Figure 1. Annual GHG emissions in B.C. under a reference case and a CLP + Federal carbon price case

Pathways

If we are successful in making net-zero ready the norm by 2032, these efficiency gains will contribute roughly a third of the emissions reductions needed (Figure 2b). The rest will have to come from the renovation of existing buildings. This can be achieved by retrofitting 3% of the building stock each year, and also converting half of these buildings from natural gas or oil to non-emitting heat sources such as electricity or low-carbon district energy systems (Figure 2d). This amount (3%) of building stock is equivalent to roughly 30,000 houses per year, 17,000 units of MURBs, and 3 million square metres of commercial/institutional space. Retrofits should reduce energy use sufficiently to protect affordability, and aim to achieve 25% emissions reductions in non-electrified buildings. Overall, an approach that combines both fuel switching and efficiency will achieve 60% emissions reductions across all retrofitted buildings

Past incentives programs have been insufficient in scale and persistence to meet the proposed retrofit targets; the combined ecoENERGY Retrofit and LiveSmart BC residential incentive programs, for example, reached on average 1% of eligible B.C. homes per year and resulted in average emissions reductions of 26% per household (less than half of the depth needed). At their peak, however, these programs showed that the proposed target retrofit and electrification rates were achievable. In the second quarter of 2009, LiveSmart BC incentive programs reached over 2,500 homes per month (3% of eligible stock annually). Between March 2008 and April 2011, over 45,000 households purchased an air source heat pump, resulting in the electrification of up to 2% of eligible households. The challenge will be to mobilize public and private resources to sustain these peak retrofit and electrification rates steadily over the next thirty years.

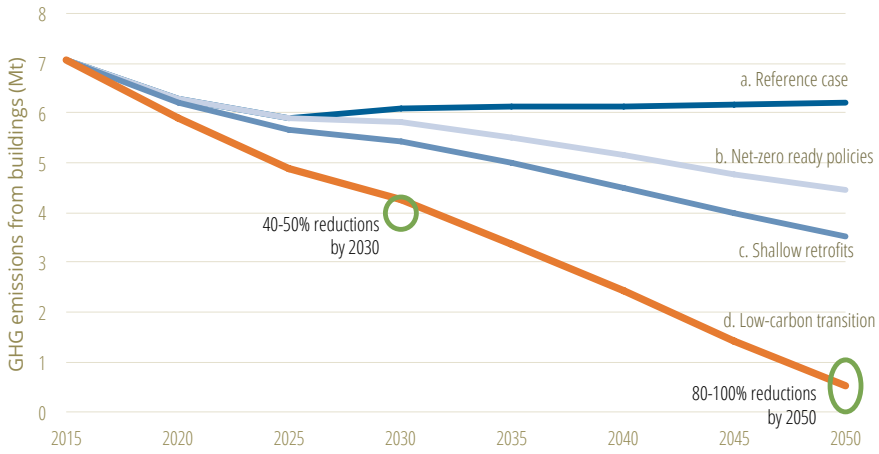

Figure 2. A 'Low-carbon transition' pathway for B.C. buildings that includes new buildings policies, a broad retrofit program, and fuel switching

Building renewal: investment and job creation

Meeting the proposed targets will require an unprecedented public and private investment in the renewal of our buildings. We estimate that meeting the 3% retrofit target in B.C. would require an investment of $750 million to $1 billion per year. This would create up to 5,000 direct jobs in the retrofit industry, another 6000 indirect or induced jobs, and $4-8 billion in GDP growth. Public investments in retrofit incentives and programming often more than pay for themselves through new tax revenues; in Germany, for example, KfW's retrofit grants and loans return $4 to $5 to public coffers per $1 invested by the national bank.

Barriers

Barriers to retrofits are complex and vary by building types (see Section 4.10). Forum participants repeatedly raised four interwoven challenges:

1. Difficulty in making a business case for retrofits on energy savings alone, particularly given's B.C. low energy costs and mild weather.
2. Lack of awareness and knowledge of decision-makers, who may lack time and/or capacity to assess the energy and non-energy benefits of retrofits.
3. Complexity of the retrofit process; in the absence of an integrated home energy performance industry, homeowners and business owners must piece together complex construction projects (e.g. contracting an energy advisor, analyzing the business case, securing financing, finding contractors, comparing quotes, sequencing the work).
4. Lack of capacity and training, specifically: in the construction industry, which is already faced with skills and labour shortages; in the real estate industry, which lacks resources to train owners and operators; and in local governments, which already struggle to keep up with permitting and inspection workloads. Trade certifications and quality control processes are lacking for most energy retrofit procedures. Programs exist, but most are voluntary and are not widely recognized or valued by the public. The repeated introduction and removal of incentives has compounded this capacity issue and has been detrimental to the establishment of a mature retrofit industry. An indicator of this is the rapid decrease in energy advisors after the end of LiveSmart: B.C. went from 188 registered energy advisors in 2011 to 21 as of October 2016.

Solutions and recommendations

Nine strategies were discussed at the forum to address these barriers. These strategies are summarized below. Please refer to the full report for an overview of key points of discussion on these at the forum.

Carbon pricing

Pricing undesired externalities, such as carbon pollution, is the most direct way to incent the market to innovate to meet desired outcomes. Most policy packages that have been shown, through economic modelling, to meet legislated targets include a price on carbon much higher than the one currently set by the federal government. B.C.'s Climate Leadership Team, for example, proposed a $10 per year increase in the carbon tax starting in 2018, rising to $110 per tonne by 2025 (Table 7). This does not mean that it would be impossible to meet the proposed building sector targets under the current price schedule as laid out in B.C.'s Climate Leadership Plan, but it does mean that other subsidies and regulations will need to be ramped up significantly to otherwise encourage efficiency and fuel switching. Recommendation:

- The Government of B.C. should increase the price signal for efficiency and conservation through carbon pricing.

Electrification strategy

In absence of a meaningful price on carbon, other measures must be considered to encourage fuel switching such that roughly half of the 3% of buildings retrofitted each year are fuel switched. An electrification strategy should answer these questions: What policies should be put in place to drive smart electrification? Do local grids have the capacity to meet the added demand, and if not, what upgrades would be necessary? And how would these costs compare with that of creating or extending district energy systems?

Recommendations:

- The Government of B.C. should articulate an electrification and fuel switching strategy to drive reductions in building emissions.
- BC Hydro should, as part of its 2018 IRP, assess the need for upgrades in local distribution systems to meet increased demand from the electrification of buildings.
- The Government of B.C. and BC Hydro should collaborate to accelerate market transformation for heat pump technology including investments in pilot projects, incentives, and training.

Retrofit codes

Given that windows, cladding and heating equipment in a given building will likely only be replaced once between now and 2050, we need to maximize the energy upgrade potential at each replacement if we are to achieve a near-decarbonized building stock by mid-century without redoing work. Retrofit codes, whether enforced at time of renovation or triggered based on performance, provide guidelines for owners on the level of performance expected of their buildings. A predictable retrofit codes schedule would provide clarity and confidence to the retrofit industry, which could then invest to meet the demand more affordably.

Regulations can lead to less-than-optimal solutions if too prescriptive. Performance-based retrofit codes for larger buildings, such as ASHRAE 100, provide both clarity of desired outcomes and the flexibility to select measures such that costs and disruption are minimized and co-benefits are maximized. The current energy code, ASHRAE 90.1-2010, provides a prescriptive path for compliance, which is appropriate for smaller (simpler) buildings. A prescriptive retrofit code tailored to the needs of Canadian homes should also be developed.

Some key necessary conditions for success of retrofit codes raised at the forum include:

1. Building the capacity of local permitting offices, most of which should start with enforcing energy codes for new buildings.
2. A process to address whether a site would be better off redeveloped than refurbished.
3. Low-barrier financing to make compliance possible and non-punitive for cash-strapped owners.
4. Integration of other social objectives deemed essentials for the resiliency of buildings (seismic upgrades, sprinklers, accessibility) into a coherent integrated retrofit code.

Recommendation:

- The Government of B.C. should adopt a schedule of retrofit requirements at time of renovation based on ASHRAE 100 for large buildings and ASHRAE 90.1 for small buildings. Working with local government, it should encourage enforcement of current energy codes at time of retrofits. Working with the federal government, it should investigate whether and how other social priorities — seismic resilience, adaptability, fire protection — could be included in an integrated retrofit code for resilient buildings.

Public financing

There are multiple ways in which publicly-raised capital could be used to accelerate retrofits. Ideas mentioned at the forum included the creation of a long-lasting retrofit program providing loans and grants; capitalization of rotating funds for retrofit investments in public buildings; and various credit-enhancements to encourage private investment in energy efficiency, such as loan-loss reserves, loan guarantees, and interest buy-downs.

Operating these programs and monitoring their success will require dedicated focus and coordination, which would be best served by creating a centralized public financing authority (or 'green bank') focused on energy efficiency and building renewal. The upcoming federal investments in housing are a one-time investment, not a sustainable financing model. Leveraging these funds to create provincial and/or federal green banks would enable the establishment of institutions with capacity to raise capital on an ongoing basis, a necessity if we are to maintain retrofit efforts between now and 2050. Ontario has taken a step in this direction with its proposed 'Green Bank', and B.C. should consider a similar model. The Federal Infrastructure Bank could play this role, but given the distributed nature of building investments and their unique challenges, it would require a dedicated department to aggregate projects and design programs suited for different market segments.

Recommendation:

- The Government of B.C. and/or the federal government should create a public financing authority (or 'green bank') focused on energy efficiency and building renewal. Current federal funds and additional provincial funds should be used to establish this organization, create a sustainable retrofit financing model leveraging public and private financing, and capitalize the first round of programs.

Energy benchmarking and disclosure

For markets to recognize the various benefits of energy upgrades, decision-makers need access to validated and comparable data on building performance. Access to reliable information supports decision-making on investments in energy efficiency. The absence of this information is a fundamental market failure that should be corrected through public policy; just as we label processed foods to support sound dietary decisions, we should label the performance of homes and buildings to support valuation of energy efficiency by the market. Voluntary programs for the assessment of energy performance

have existed for several years, but uptake will remain low and limited to high performers until reporting of energy performance data is a requirement.

Recommendations:

- The Government of B.C. should require home energy labelling at time of sale by 2019.
- The Government of B.C. should require energy benchmarking for buildings larger than 50,000 square feet, with mandatory disclosure within three years.

Valuation of non-energy benefits

Given the difficulty in making the business case for retrofit projects on energy cost savings alone, many participants highlighted the importance of fostering a greater understanding, and ultimately valuation, of non-energy benefits. These include decreased maintenance costs, improved comfort, health, productivity, increased resale value, etc.

Measuring health benefits related to energy upgrades could be a strong argument for increased investment, particularly in low-income housing. Symptoms of respiratory and cardiovascular conditions, rheumatism, arthritis and allergies can be reduced through improved ventilation systems and airtightness, both in new construction and in existing buildings.

Recommendations:

- The Government of B.C. should work with the B.C. Assessment and the Appraisal Institute of Canada to identify and collect data needed to consider energy efficiency upgrades in property assessments.
- Governments and utilities should work with media, public personalities, the home performance and development industry, and realtors to amplify messages on non-energy benefits of retrofits.
- Academic institutions should pursue further research and communication on the link between energy upgrades and improved productivity, health, and comfort.

Project aggregation

Instead of tackling each retrofit as a unique project, economies of scale can be obtained by issuing energy services contracts for several buildings with similar characteristics. This aggregation model was piloted by the Dutch *EnergieSprong* program in the social housing sector. This approach allows the creation of contracts of sufficient value to justify investments in research and development; it proposes a paradigm shift from a

market where private companies tell building owners what is available for retrofits, to one where owners collectively define criteria for retrofits and private companies innovate to meet this demand.

Recommendation:

- BC Housing should form a multi-stakeholder working group to pilot aggregation of demand in the B.C. social housing sector.

Integrated delivery

The retrofit process can be simplified by the creation of integrated retrofit services, whether delivered by a 'one-stop shop' company acting as project manager, or coordinated by a financing agency with a network of pre-certified contractors. An integrated delivery model would remove barriers to entry by streamlining the process for homeowners. It would also drive deeper retrofits by proposing a sequenced package of measures that can be implemented one at a time, and creating a continuous relationship to see them through over the years.

A steady demand for services needs to be secured before integrated services can be profitably developed. This can be achieved by a combination of strategies such as public financing, regulations, energy labelling, and innovative financing mechanisms. Additionally, governments need to build the capacity of the renovation industry to meet this demand and ensure the quality of installations.

Recommendation:

- The Government of B.C. and the federal government should support the development and implementation of training, certification, and quality assurance programs for trades and professionals in the building sector, considering the specific needs of the construction industry, the real estate industry, and local governments.

Innovative financing mechanisms

With $2.9 billion invested in the last year alone, the success of PACE financing for residential and commercial buildings in California illustrates the potential of pairing a low-barrier financing model with an integrated single point of access providing pre-qualified contractors, quality assurance, and outreach.

Various financing solutions have been proposed to address barriers to private investment in energy upgrades, barriers that include split incentives, hyperbolic

discounting of future savings, competition for limited borrowing capacity, and long amortization periods. Three mechanisms were discussed at the forum: on-property-title loans (or PACE), metered energy efficiency, and loans to strata corporations.

These aim to reduce loan rates by attaching loan repayment to bills that are routinely paid (property taxes, utilities), thus reducing default risk. Tying the loan to the property or the meter, rather than the individual, removes split incentives by enabling the transfer of the loan at time of sale, and reduces competition with other possible investments (e.g. new lobby or granite countertops) by providing off-the-ledger lending. Transferability at time of sale makes longer-term loans more acceptable, which reduces the loan repayments to a level where they can be offset by energy cost savings, or integrated with other housing costs without undue burden on homeowners or tenants.

Recommendations:

- The Government of B.C. should work with local governments to create a Local Improvement Charge (LIC) structure to fund energy efficiency, water conservation, climate adaptation and renewable energy upgrades.
- Governments and utilities should be engaged to evaluate and fund a pilot of the Metered Energy Efficiency Transaction Structure in a high-profile commercial building in B.C.
- The federal government should work with provinces, local governments and Canada Mortgage and Housing Corporation to harmonize rules across the country for LIC programs and remove barriers to applicants (e.g. requirement for lender consent).
- The Government of B.C. should require depreciation reports to incorporate energy conservation options provided by energy audit and to provide recommendations for cost-effective measures to be integrated in maintenance plans.
- The Government of B.C. should provide credit enhancement or otherwise remove barriers to encourage strata corporations to borrow funds to cover energy efficiency upgrades.

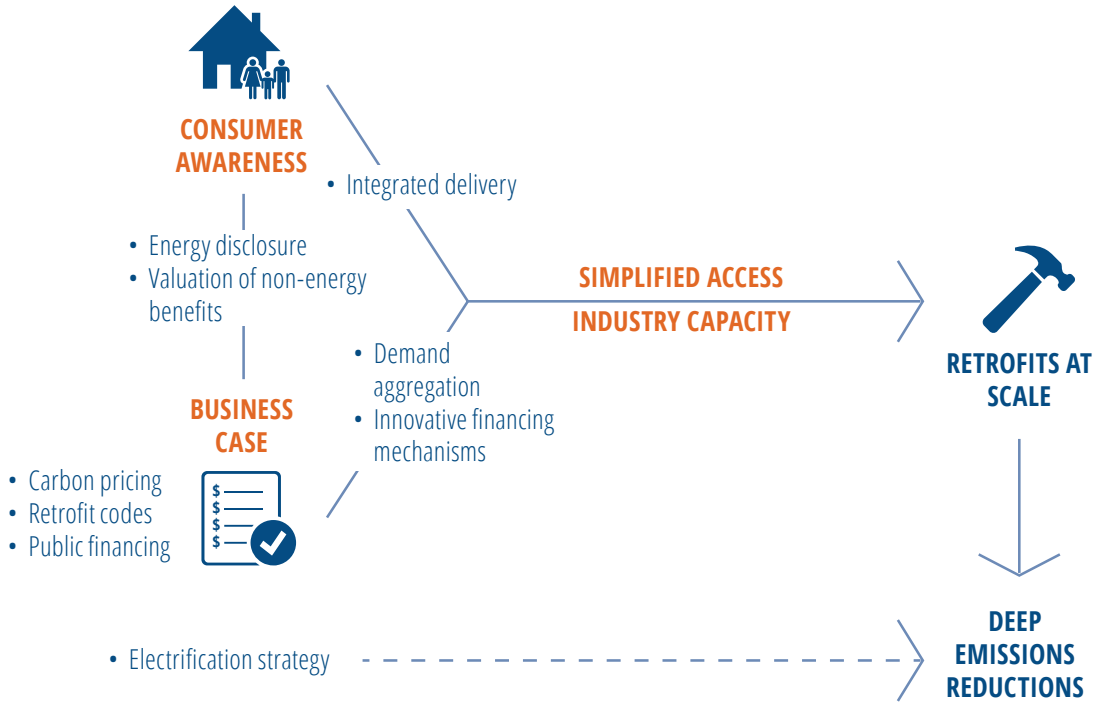

Figure 3. Necessary conditions and systemic interventions for deep retrofits