

June 29, 2021

Passive House Canada Submission for the National Infrastructure Assessment

Overview of Recommendations

1. Align policies, standards and regulations with Canada's climate targets to ensure Canada is on track to achieve our desired outcomes. Ensure health and comfort are accounted for when advancing efficiency measures.
2. Target 80%-90% efficiency in new buildings to reduce the use of carbon fuels used to condition buildings, to reduce the burden on our energy grid and to avoid the need for future retrofits. For retrofitted buildings, target 60% efficiency improvement over the existing building (the vast majority of buildings will be able to hit this target. Exceptions may include heritage buildings).
3. Clearly define the terminology "net zero", the path Canada will take to get to net zero and ensure it's well understood within industry to enable them to effectively prepare.
4. Ensure that government incentives encourage a whole of building approach to building retrofits that lead with health and comfort.
5. Set high energy efficiency targets now to avoid duplication of cost and effort to achieve Canada's 2050 climate targets.
6. Utilize conflict of interest policies on regulatory committees to ensure stakeholder disclosure. Include high performance building expertise on committees and panels that are making decisions about how to innovate in the building sector to achieve Canada's climate targets.
7. Prioritize and incentivize workforce capacity building for high performance buildings for both new and retrofit.
8. Incentivize early adoption of net-zero building practices now.

Current State of the Market

The Canadian building sector is on the cusp of a massive transformation. Decision makers from all levels of government are now looking at how public policy can support greener building practices for both new buildings and retrofits. There is an opportunity for the federal government to catalyze this shift through its long-term vision for the sector and transform the way we build.

To drive this change and achieve our climate targets of 40%-45% below 2005 levels by 2030, Canada must implement robust policies, standards, regulations, a clear path forward for industry and sustainable funding supports. Operational emissions must be addressed in all building types by maximizing energy efficiency first to minimize energy demand on our electrical grid. Remaining energy demand can then be met with renewable energy sources. As operational emissions are driven down, embodied carbon must also be considered and addressed.

Current federal policies and programs, such as the Greener Homes Grant, are headed in the right direction. However, research shows that Canada will need to exponentially increase its financial investment and significantly strengthen its policies and programs to successfully achieve our climate targets.¹ For example, the 2021 Budget sets out an investment of \$4.4-billion over five years to retrofit 200,000 households. However, to retrofit all existing residential buildings, 600,000 dwellings will need to be retrofitted each year from now until 2040, and this only accounts for minor upgrades in residential homes.

¹ International Energy Agency. (2021). Net Zero by 2050: A Roadmap for the Global Energy Sector. <https://www.iea.org/reports/net-zero-by-2050>

Older, large buildings currently offer the greatest opportunity to drive down emissions through deep energy retrofits. It is for this reason that social housing providers across Canada are leading in deep energy retrofits of their building stock including to the Passive House retrofit standard (EnerPHit). A strong business case exists for building owners and operators, like social housing providers, that need to address deferred capital repairs but also want to improve tenant health and quality of life, drive down emissions, increase climate resilience and increase their operational savings. There is also an opportunity in this sector to replicate building design to more effectively and rapidly scale up deep energy retrofits. In Ontario, social housing providers that are capitalizing on this approach currently include Toronto Community Housing, Ottawa Community Housing, Windsor Essex Community Housing and CityHousing Hamilton. They are driving the market for local production of high-performance building products and calling on industry to adapt to be ready to respond to their RFPs. This is one sector that needs greater government support to continue its progress.

Furthermore, data is increasingly available demonstrating that net zero building practices don't need to be associated with higher costs of construction. We know that as Passive House buildings and EnerPHit deep energy retrofits are delivered at scale, costs decrease.² For example, the largest North American dataset for new construction of affordable housing from the Pennsylvania Housing Finance Authority is tracking 268 projects, 74 of which are Passive House projects. In the first year of their program, when few Passive House projects existed in the state, Passive House projects cost an average of 5.8% above conventional buildings. In the second year, that premium dropped to 1.6% and by the third year Passive House projects were, on average, 3.3% cheaper than conventional buildings. Over those three years the average cost of a Passive House project was 1.7% less than other projects.³ Affordability and high-performance buildings can co-exist.

Increasingly, municipalities are also taking leadership roles in driving the market shift through their development of green building standards. The City of Toronto's Green Standard is one example of leading municipal building policy. It takes a tiered approach to new construction that, over time, will require builders to construct to higher performance levels. Other municipalities are taking a hands-on approach by deep energy retrofitting their public sector buildings first to demonstrate that it is now possible to build net zero and Passive House buildings. Unfortunately, we hear from our municipal stakeholders across Canada that current provincial and federal standards and regulations limit what they can do and what they can enforce. They continue to face barriers and pushback to progress. Without provinces and the federal government increasing the stringency of their regulations and standards, progress locally will continue to be significantly affected.

The Threat of Climate Change and Need for Adaptation

Physical infrastructure is a major area of climate change risk facing Canada.⁴ Risks to physical infrastructure from extreme weather events include damage to homes, buildings, and critical infrastructure from heavy precipitation events, high winds, and flooding; increased probability of power outages and

² Lucon O, Ürge-Vorsatz D. (2014). Buildings. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. *Cambridge University Press*. https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter9.pdf

³ Ürge-Vorsatz D., Khosla R., Bernhardt R., Chieh Chan Y., Vérez D, Hu S., Cabeza L.F. (2020). Advances Toward a Net-Zero Global Building Sector. *Annual Review of Environment and Resources* 45:1, 227-269. <https://www.annualreviews.org/doi/abs/10.1146/annurev-environ-012420-045843>

⁴ Council of Canadian Academies. (2019). Canada's Top Climate Change Risks. *The Expert Panel on Climate Change Risks and Adaptation Potential, Council of Canadian Academies*. <https://cca-reports.ca/wp-content/uploads/2019/07/Report-Canada-top-climate-change-risks.pdf>

grid failures; and an increasing risk of cascading infrastructure failures. Buildings that waste energy and drive-up emissions not only pose a threat to further climate change and exasperate the need to keep buildings cooler in the future, but also propagate negative consequences onto human health, food security, and the ecosystems on which society depends.

Ensuring that buildings constructed today are climate resilient will reduce costs and improve health outcomes for Canadians. We advocate that Passive House new buildings and retrofits (EnerPHit) are the most effective way to build climate resilient, net zero buildings. This is because Passive House is science and outcomes based and significantly reduces energy use and reliance on energy systems. When extreme weather occurs and power is lost, studies have shown that individuals living in Passive House buildings can shelter in place for up to two weeks.⁵ Constructing climate resilient buildings prior to 2050 will be critical to improving health outcomes for Canadians in the long-term. Furthermore, in Canada, buildings represent the highest cost of adaptation as a percentage of our GDP.⁶ Significant research has been done on this subject and the results are clear, the cost of inaction now will be the most expensive approach for Canadians in the long-term.

Best Practices for New Builds and Deep Energy Retrofits

There are three imperatives for reducing emissions in buildings: maximizing operating efficiency, meeting energy needs with renewable sources, minimizing embodied carbon, and all as soon as possible. Clear and measurable outcomes for buildings need to be established for new and retrofit construction. The international Passive House standard is the most stringent energy efficiency standard currently utilized at scale. For that reason, the Passive House level of operating efficiency is a highly effective pathway to achieve net zero and zero emissions buildings.

By 2030, new buildings will account for one quarter of the buildings we will inhabit. Targeting high levels of efficiency in new building construction now is more cost efficient than retrofitting them later.⁷ It also enables industry to build its capacity to construct high performance buildings sooner. Likewise, investing in deep energy retrofits now rather than later will save costs in the long run and set Canada up on a path to achieve its climate targets in relation to buildings. By targeting lower emissions reductions in building retrofits (40% and under), we are setting ourselves for higher costs in the long-term as these buildings will need to be upgraded prior to 2050 to achieve Canada's climate targets. Costs rise even higher if the initial retrofit design does not account for the need to ultimately maximize efficiency (60% or higher). Effective deep energy retrofits result in lower energy costs, reduced maintenance requirements, improved indoor air quality, increased climate resilience, increased interior comfort and health, increased property value, and reduced emissions. These outcomes can be achieved when a whole of building approach is taken with an integrated design approach upfront to maximize efficiency and utilize simpler mechanical systems and high-quality components.

Policies, standards and regulations need to clearly align with Canada's long-term climate targets. Doing so ensures that all government initiatives are effectively working together to get Canada on track and stay on track to meet our goals. It also signals to the market what's coming and enables it to better plan and

⁵ Ürge-Vorsatz D., Khosla R., Bernhardt R., Chieh Chan Y., Vérez D, Hu S., Cabeza L.F. (2020). Advances Toward a Net-Zero Global Building Sector. *Annual Review of Environment and Resources* 45:1, 227-269.

<https://www.annualreviews.org/doi/abs/10.1146/annurev-environ-012420-045843>

⁶ Green Analytics Corp. (2020). Investing In Canada's Future: The Cost of Climate Adaptation at the Local Level.

<https://data.fcm.ca/documents/reports/investing-in-canadas-future-the-cost-of-climate-adaptation.pdf>

⁷ Saxe, D. (2018). Greenhouse Gas Progress Report. <http://media.assets.eco.on.ca/web/2016/11/2016-Annual-GHG-Report-ENGLISH.pdf>

prepare. Canada's approach to building retrofits is one area where a more robust strategy supported by policy, regulation and funding support is needed to effectively and rapidly scale up deep energy retrofits for all building types. The majority of buildings in Canada can achieve energy efficiency improvements of 60% or higher. The technology and knowledge exist today to do so. Accepting anything less will be more costly in the long run.

Comprehensive policies, standards and regulations for the building sector will drive economic competitiveness and job growth. Construction is one of the most effective employment generators. For every \$1 million invested in energy efficiency improvements, it is estimated that up to \$3 to \$4 million is generated in GDP.⁸ By supporting the local production of high-performance building products, Canada can meet the supply needs of the market and respond to export demand. With increasingly stringent environmental policies in the United States, Canada could be well positioned to supply that market.

Recommendation: Align policies, standards and regulations with Canada's climate targets to ensure Canada is on track to achieve our desired outcomes. Ensure health and comfort are accounted for when advancing efficiency measures.

Recommendation: Target 80%-90% efficiency in new buildings to reduce the use of carbon fuels used to condition buildings, to reduce the burden on our energy grid and to avoid the need for future retrofits. For retrofitted buildings, target 60% efficiency improvement over the existing building (the vast majority of buildings will be able to hit this target. Exceptions may include heritage buildings).

Threats to Progress

Net Zero Terminology:

The terminology "net zero" and "net zero ready" when applied to buildings can be confusing and misleading to industry. Depending on the government or the organization using these terms, they may mean different things. When other terminology is added, such as "net zero emissions," "net zero energy," or "net zero carbon," we are setting industry up to fail. To avoid this pitfall, government needs to clearly define what net zero means for industry and the outcomes we're looking to achieve in new buildings and retrofits.

Recommendation: Clearly define the terminology "net zero", the path Canada will take to get to net zero and ensure it's well understood within industry to enable them to effectively prepare.

Fuel Switching:

Fuel switching to lower-carbon or renewable sources, while needed, should not be used as a fix all approach. A whole of building retrofit approach must be taken to ensure health and comfort are achieved in highly efficient buildings. Furthermore, there is no sustainable path forward for buildings that does not begin with maximizing efficiency. While fuel switching will account for significant emissions reductions, we also need to minimize the burden on our electrical grid and ensure that our electricity is produced by low carbon sources.

Recommendation: Ensure that government incentives encourage a whole of building approach to building retrofits that lead with health and comfort.

⁸ Garrett-Peltier H. (2017). Green versus brown: Comparing the employment impacts of energy efficiency, renewable energy, and fossil fuels using an input-output model. *Economic Modelling*, 61, 439-447. <https://www.sciencedirect.com/science/article/pii/S026499931630709X?via%3Dihub>

Short-term Thinking:

Buildings are critical to healthier, more sustainable communities in Canada. Given the enduring nature of buildings, it's important to set ambitious targets and outcomes for new buildings and retrofits. In an effort to ease industry into these changes, Canada is currently incentivizing and driving the construction of buildings targeting mid-level performance. This approach will cost us more in the long run. Each retrofit targeting efficiency improvements ranging from 30-40%, when 60%-70% is feasible, will require further investment, redesign and construction in the near future to achieve Canada's 2050 targets. Costs may be further driven up depending on how the retrofit was initially designed. The most expensive building to construct is one that adds efficiency measures to conventional buildings. The most affordable way to build a high-performance building is to design differently from the outset.

Recommendation: Set high energy efficiency targets now to avoid duplication of cost and effort to achieve Canada's 2050 climate targets.

Systemic Factors Limiting Canada's Ability to Deliver Better Buildings

Policy and regulatory decisions are often based off the decisions of regulatory committees. Many of the individuals who sit on these committees have limited experience designing and delivering high performance buildings and deep energy retrofits. It is common for these individuals to have misconceptions about how to build high performance buildings and the costs associated with this type of building standard. Moreover, many committee participants are representatives of industries that have a stake in maintaining the status quo. This threatens Canada's ability to implement codes, standards, and policies that deliver the outcomes required to achieve our climate targets.

Recommendation: Utilize conflict of interest policies on regulatory committees to ensure stakeholder disclosure. Include high performance building expertise on committees and panels that are making decisions about how to innovate in the building sector to achieve Canada's climate targets.

Industry Resistance to Change:

While perception of high construction costs and fear of capacity building persist in the building industry, we know that the status quo will not get us to where we need to go. High costs of construction associated with changing the way we build is known to be associated with the cost of learning. Case studies show that as the construction of high-performance buildings scale up, the incremental costs of building to a higher quality decrease. (Increasing building material costs as a result of supply chain issues during the covid-19 pandemic are issues that all builders are facing, regardless of the performance level of the building being constructed.) Training industry to build better is not a years-long endeavor. For example, Passive House Canada trains tradespeople to become Passive House trades certified in 12 hours offered over the course of 3 days. Government has a key role to play in incentivizing industry to get trained and to be early adopters of ambitious building practices. Doing so will drive the growth of the supply chain needed to support industry. This includes investment and the Canadian manufacturing of high-performance building products.

Recommendation: Prioritize and incentivize workforce capacity building for high performance buildings for both new and retrofit.

Recommendation: Incentivize early adoption of net-zero building practices now.