September 21, 2021

Honourable David Eby
Attorney General
Minister Responsible for Housing
Room 232 Parliament Buildings
Victoria, BC V8V 1X4
AG.Minister@gov.bc.ca

RE: Carbon Performance Requirements for New Developments

Dear Honourable David Eby,

We commend your Ministry's commitments to affordability, equity, and reducing carbon pollution from BC's buildings.

As you know, in March 2021, the BC government established a target for BC Buildings and Communities to reduce total GHG emissions 59%-64% below 2007 levels by 2030. Achieving this target will require new buildings to be zero GHG emissions in their operations as soon as possible. Building emissions are the source of 13% of BC's GHGs. As Minister Responsible for Housing, you have within your portfolio an important means by which to make clear to British Columbians that we face a climate emergency, and that your government is prepared to meet this moment with bold action.

We the undersigned are calling upon you to require zero emissions new construction in the BC Building Code. In BC's more temperate climate zones (e.g. Climate Zones 4 and 5), where the large majority of new development occurs, zero emissions requirements should come into effect by January 2023 (if not late 2022). These requirements may then expand to colder parts of the Province, where markets for heat pump systems are less well developed, in subsequent years (e.g. 2024 or 2025).

It is critical for buildings' emissions performance requirements to be structured appropriately to ensure real-world outcomes. The best way to ensure zero emissions is to require new construction be all-electric, with no gas plumbing to major building energy end uses like space heating, domestic hot water and clothes drying; requirements should continue to allow new buildings to connect to neighbourhood district energy systems. Such All-electric requirements, and "all-electric preferred reach codes", have been adopting by over 47 leading cities in North America, including Seattle, San Francisco, and Sacramento.

We also urge you and your government to give priority to measures such as differential electric utility rates and capital grants to ensure that new housing is more affordable for BC's most vulnerable citizens during the transition to a more sustainable future. While zero emissions all-electric buildings can be cost-competitive with polluting buildings, these measures can mitigate the occasional circumstances where a zero emissions all-electric building is more costly or entail higher monthly operating costs.

The attached Issue Brief provides further background and references to additional information, including recommended language for all-electric building system requirements.

Thank you & best regards,

Will Cole-Hamilton, Councillor, City of Courtenay & Director, Climate Caucus
Stephanie Smith, President, BC General Employees' Union
Thom Armstrong, CEO, Co-operative Housing Federation of BC
Jill Atkey, CEO, BC Non-Profit Housing Association
Melissa Lem, President-elect, Canadian Association of Physicians for the Environment
Dr Linda Thyer, Doctors for Planetary Health
Laurel Hart, Babies for Climate Action – Vancouver
Marian Hakze, For Our Kids Northshore
Maureen Marriott, For Our Kids Vancouver
Liz McDowell, Director of Digital and Campaign Strategies, Stand.Earth
Seth Klein, Team Lead, Climate Emergency Unit
Peter McCartney, Climate Campaigner, Wilderness Committee
Alexandra Woodsworth, Campaigns Manager, Dogwood
Celine Trojand, Chief Impact Officer, on behalf of Ecotrust Canada
Ian Bruce, Acting Executive Director, David Suzuki Foundation
Brendan Haley, Policy Director, Efficiency Canada
Karen Tam Wu, Regional Director, BC & Tom-Pierre Frappé-Sénéclauze, Buildings & Urban Solutions Director Pembina Institute
Chris Ballard, CEO, Passive House Canada
Rob Bernhardt, Former CEO, Passive House Canada
Albert Rooks, Chief Executive Officer, Small Planet Supply & President, Passive House Northwest
Sunny Ghataurah, P. Eng., President, & Brendan McEwen, Director Low Carbon Strategies, AES Engineering Ltd.
Lisa Westerhoff, Principal, & Stuart Hood, P.Eng., Regional Director, British Columbia, Integral Group
Jennifer Cutbill, Architect AIBC, FRAIC, Principal, Lateral Agency
Peter Sundberg, Executive Director, City Green Solutions
Jason Packer, President, Recollective Consulting Ltd.
Devon Miller, Principal, Origin Sustainable Design + Planning
Christine Gustafson, P.Eng., C.E.M. - Harbourgreene Consulting Inc.
Louis Conway, Architect
Dani Pretto, Principal, Vanterre
Shirley Shen, Director, Haeccity Studio Architecture

Attachments:
Issue Brief: Structuring Carbon Performance Requirements to Best Realize Climate Benefits. July 2021.

Issue Brief:

Structuring Carbon Performance Requirements to Best Realize Climate Benefits

July 2021

Prepared By: Brendan McEwen, AES Engineering

Background

In March 2021, the BC government established a target for BC Buildings and Communities to reduce total GHG emissions 59%-64% below 2007 levels by 2030.[1] Achieving this target will require zero GHG emissions new construction in the Province as soon as possible.

The BC Attorney General and Minister Responsible for Housing the Honourable David Eby's Mandate Letter includes the following: "Build on our government's work to require new buildings and retrofits to be more energy efficient and cleaner by supporting local governments to set their own carbon pollution performance standards for new buildings."[2] Accordingly, it is understood the Province is now exploring how to structure carbon performance requirements for new buildings.

How to Define "Carbon Pollution Performance"

A recent report prepared for the BC Local Government Energy Step Code Peer Network identified two options to define "carbon pollution performance":[3]

1. All-electric building systems. This option specifies that new buildings be all-electric, with no gas plumbing to major building energy end uses like space heating, domestic hot water and clothes drying. All electric building requirements, and "all-electric preferred reach codes", have been adopted by over 45 leading cities in the USA, including Seattle,[4] San Francisco, Sacramento, San Jose and Oakland[5], and by the City of Vancouver in its prescriptive energy requirements for new Part 9 buildings. A definition of what constitutes "all-electric building systems" is included in Appendix 1 of this document – This definition broadly aligns with language in other high performance zero emissions codes for new buildings, including the New Buildings Institute's *Building Decarbonization Code;*[6] the California Statewide Codes & Standards Program's *New Construction Model Reach Code*;[7] and Architecture 2030's *Zero Code*.[8]

2. Greenhouse gas intensity (GHGI). GHGI is a modeled value, derived from the energy models used to document compliance with the Energy Step Code. GHGI is measured in units of kilograms of CO_2 equivalent per metres squared of building area per year (kg $CO_2e/m^2/yr$). To date, ten municipalities in BC have referenced GHGI in their policies.[9]

Comparing "All-Electric" Building Requirements and GHGI

In addition to energy efficiency, building electrification (the use of efficient electrical appliances, like heat pumps and induction stoves, instead of fossil fuel or other combustion equipment) is essential to decarbonize buildings.[10] The carbon intensity of electricity supplies is decreasing across North America, meaning electrification will yield increasing emissions reductions over time. BC benefits from already having very low carbon intensity electricity.

While GHGI metrics have been referenced by some BC local governments, many policy experts view all-electric building requirements as an even better climate policy, and such requirements are being used by a growing number of local governments across North America.

All-electric building requirements can best ensure real-world emissions reductions. Achieving lower GHGI values usually requires that buildings be modeled to source increasing amounts of their end use energy from electric equipment. However, GHGI allows buildings to connect to the gas distribution system, and other sources of fossil fuel. GHGI is a modeled value. In real world operations, buildings may use more gas than they were modelled to use, because:

- Projects can model their buildings to only use a little bit of fossil gas for "back up" systems that would theoretically only run for a few hours a year. However, in real world operations, it is possible these systems would run the majority of the time, resulting in much more GHG intensive buildings.

- Building owners may convert additional systems to gas in the future. Allowing for gas connection makes it much easier to convert to gas.

Additionally, GHGI can allow projects to be modelled to assume they will purchase "Renewable Natural Gas" (RNG)* for the lifetime of the building, and deem this RNG zero carbon. As noted below, it is problematic to allow models used in new construction requirements to assume RNG use for the lifetime of the building.

Requirements that reference GHGI can certainly result in better climate outcomes than not having any carbon performance requirements. However, especially given BC electricity's already very low GHG emissions, it makes sense to require new buildings to be efficient and all-electric, with no gas connection.

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* "Renewable natural gas" (RNG) refers to a variety of non-fossil sources of methane gas, including:
  - Bio-methane (e.g. methane derived from biological feedstocks, such as manure, energy crops, forestry residues, etc.)
  - Landfill gas.
  - Synthetic methane (i.e. power to methane).
  - Blending low carbon sources of hydrogen (H_2) gas into the gas supply system, e.g. "green hydrogen" (i.e. H_2 derived from electrolysis of low carbon sources of electricity) or "blue hydrogen" (i.e. H_2 derived from fossil fuels with carbon captured and sequestered).

Isn't "Renewable Natural Gas" Appropriate to Use in New Construction?

No. RNG may play a niche role in decarbonizing some existing buildings, and in other sectors (e.g. industrial heat) where emissions are "hard to abate".[11] However, electrification will do the lion's share of building decarbonization work. Notably:

- Sources of RNG are limited and expensive. The American Gas Federation estimates 5% (low scenario) to 12% (high scenario) of US gas demand could be met through RNG by 2040; Natural Resources Defense Council estimates 3% to 7%.[12] A study prepared for the California Energy Commission found that even under optimistic cost assumptions, RNG would be 8 to 17 times more expensive than projected baseline natural gas costs, and that building electrification comprises a lower cost building decarbonization pathway.[13] A study prepared for the Province of BC likewise finds 6% of 2019 BC gas throughput could be met in the long-term via non-forest RNG feedstocks available in BC, at costs up to $28/GJ (ten times the current cost of gas for FortisBC Mainland and Vancouver Island residential customers).[14]

- Biologically derived RNG may be GHG intensive, and land intensive. Some biological feedstocks for RNG are legitimately very low carbon; however, these sources are limited. A World Resource Institute report documents that common sources of RNG (e.g. wastewater sludge; landfills) are not zero GHG emissions, and are typically 20% to 100% as GHG intensive as conventional fossil gas.[15] A 2017 study prepared for the Province of BC found that 78% of the total long-term technically feasible feedstocks of RNG were roadside logging residues.[16] RNG derived from logging residues may not actually offer any climate benefits at important time scales (e.g. in the next 50+ years) – a 2019 study authored by Canadian Forest Service staff finds that deriving RNG from logging residues that would otherwise not be piled and burned (e.g. left on site) may take 20 to 75 years to realize any climate benefit relative to fossil gas; before this time RNG from logging residue feedstocks results in "carbon debt", contributing more $C0_2e$ in the atmosphere than fossil gas.[17]

- Producing RNG sources like synthetic methane gas or "green hydrogen" is highly energy inefficient compared to using electricity directly in electrical appliances like heat pumps. Using clean electricity to generate synthetic methane or hydrogen requires 600% to 1400% more energy than using that electricity directly to run a heat pump.[18]

- Combustion of RNG results in indoor and outdoor air pollution. A recent study by the Harvard School of Public Health finds that the total health impacts from burning natural gas in the USA are now equal to coal, and that the most harmful sources of air quality contaminants from natural gas are buildings and industrial boilers.[19] Likewise, households with gas stoves often experience levels of indoor air contaminants that exceed health guidelines.[20]

- Enforcing use of 100% RNG in perpetuity could be challenging. It would be challenging for local government authorities having jurisdiction (AHJs) to ensure that new construction use RNG in perpetuity for the lifetime of the building.

For these reasons, many building policy experts suggest it is best that new construction not be allowed to comply with carbon pollution performance requirements through the use of RNG.

Can All-Electric Buildings Be Constructed and Operated Affordably?

Yes. The BC Energy Step Code Metrics Research report,[21] research prepared for the City of Richmond,[22] a variety of other studies,[23] and real-world all-electric developments, show that all-electric buildings can be the same or lesser cost to build and operate as those with gas systems. This is especially true of buildings with mechanical cooling, which will be in increasing demand with warmer future temperatures (electric heat pump systems can also provide space cooling). A review of seven high performance multifamily buildings produced by the Zero Emissions Building Exchange found that all-electric buildings were lower capital cost than very efficient buildings that included gas.[24]

All-electric building systems are likely to represent the lowest cost way of decarbonizing buildings, particularly new buildings. A study prepared for the California Energy Commission evaluates different energy system pathways to achieve GHG emissions reduction targets, and concludes that "building electrification is likely to be a lower-cost, lower-risk long-term strategy compared to RNG".[25]

Conclusion

The Government of BC should update the BC Building Code to require all-electric buildings in BC's more temperate climate zones (e.g. Climate Zones 4 and 5) by 2023, and expand these requirements to other parts of the Province in subsequent years (e.g. 2024 or 2025).

Requiring all-electric, energy efficient buildings with no gas plumbing is the best means of ensuring real world emissions reductions and healthy building systems.

Appendix 1: Definition of All-Electric Building System Requirements

The following language is provided for the Province and local governments to consider as they seek to develop carbon pollution performance standards. This definition is largely derived from the definition of an "all-electric building" in the *New Construction Model Reach Code: Electric-Preferred Version - Version 2.5* prepared by the California Reach Codes subprogram of the California Statewide Codes & Standards Program and the New Buildings Institute's Building Decarbonization Code. This definition has been altered to include an option to allow connection to district energy.

This model language does not constitute legal advice and is intended for illustrative purposes only, without any express or implied warranty of any kind, including warranties of accuracy, completeness, or fitness for any particular purpose. Use of this model language is without any recourse whatsoever to Brendan McEwen (DBA McEwen Climate and Energy), AES Engineering Ltd., or any other parties.

Definition

"All-electric building systems" means a building energy system that uses electricity as the source of energy for all its space heating, water heating, cooking and clothes drying appliances and has no combustion equipment nor plumbing for combustion equipment in the building for these end uses [*OPTIONAL ADDITIONAL TEXT:* "with the exception that the building may be plumbed for the use of natural gas or propane as fuel for cooking appliances in a commercial kitchen {*other end uses could likewise be considered}*]. The building may include solar thermal collectors. The building may connect to district energy systems, as defined by the Authority Having Jurisdiction.

Endnotes

[1] https://news.gov.bc.ca/releases/2021ENV0022-000561

[2] https://www2.gov.bc.ca/assets/gov/government/ministries-organizations/premier-cabinet-mlas/ministerletter/eby_mandate_2020_jan.pdf

[3] AES Engineering. 2021. *Low Carbon Building Systems in Energy Step Code Requirements.* Prepared for BC Local Government Energy Step Code Peer Network. https://docs.communityenergy.ca/wpcontent/uploads/LowCarbonBuildingSystems_in_ESC_Requirements_Report.pdf

[4] Natural Resources Defense Council. 2021. *Seattle Gets Most Fossil Fuels Out of New Large Buildings*. https://www.nrdc.org/experts/elizabeth-stampe/seattle-code-gets-most-fossil-fuels-out-new-large-buildings

[5] Sierra Club. 2021. *California's Cities Lead the Way to a Gas-Free Future.* https://www.sierraclub.org/articles/2021/01/californias-cities-lead-way-gas-free-future

[6] https://newbuildings.org/resource/building-decarbonization-code/

[7] https://localenergycodes.com/

[8] http://zero-code.org/

[9] AES Engineering. 2021. *Low Carbon Building Systems in Energy Step Code Requirements.*

[10] See for example. International Energy Agency. 2021. *Net Zero by 2050: A Roadmap for the Global Energy Sector.* https://www.iea.org/reports/net-zero-by-2050 ; Princeton University. 2021. *Net-Zero America.* https://acee.princeton.edu/rapidswitch/projects/net-zero-america-project/; Centre for Climate and Energy Solutions. 2018. D*ecarbonizing U.S. Buildings*. https://www.c2es.org/document/decarbonizing-u-s-buildings/; Rocky Mountain Institute. 2020. "Building electrification is key to a safe climate future" https://www.greenbiz.com/article/building-electrification-key-safe-climate-future ; Natural Resources Defense Council. 2019. "Global Effort to Decarbonize Buildings Is Accelerating". https://www.nrdc.org/experts/merrianborgeson/global-effort-decarbonize-buildings-accelerating ; Energy Innovation. 2021. *A 1.5C NDC for Climate Leadership by the United States*. https://energyinnovation.org/wp-content/uploads/2021/04/A-1.5-C-Pathway-to-Climate-Leadership-for-The-United-States_NDC-update.pdf

[11] European Gas Association. 2019. Gas for Climate Study. https://gasforclimate2050.eu/wpcontent/uploads/2020/03/Navigant-Gas-for-Climate-The-optimal-role-for-gas-in-a-net-zero-emissions-energysystem-March-2019.pdf; Natural Resources Defense Council. 2020. *"Renewable" Gas – A Pipe Dream or Climate Solution?* https://www.nrdc.org/experts/merrian-borgeson/report-renewable-gas-pipe-dream-or-climate-solution

[12] https://www.nrdc.org/sites/default/files/pipe-dream-climate-solution-bio-synthetic-gas-ib.pdf

[13] E3. 2020. *The Challenge of Retail Gas in California's Low-Carbon Future: Technology Options, Customer Costs, and Public Health Benefits for Reducing Natural Gas Use*. California Energy Commission. https://ww2.energy.ca.gov/2019publications/CEC-500-2019-055/CEC-500-2019-055-F.pdf

[14] Hallbar Consulting. 2017. *Resource Supply Potential for Renewable Natural Gas in B.C.* Prepared for Province of British Columbia, FortisBC Inc., and Pacific Northern Gas Ltd." https://www2.gov.bc.ca/assets/gov/farming-naturalresources-and-industry/electricity-alternative-energy/transportation/renewable-low-carbonfuels/resource_supply_potential_for_renewable_natural_gas_in_bc_public_version.pdf

[15] World Resources Institute. December 2020. Renewable Natural Gas as a Climate Strategy: Guidance for State Policymakers. https://files.wri.org/d8/s3fs-public/renewable-natural-gas-climate-strategy.pdf

[16] Hallbar Consulting. 2017. *Resource Supply Potential for Renewable Natural Gas in B.C.* Prepared for Province of British Columbia, FortisBC Inc., and Pacific Northern Gas Ltd.

[17] Rut Serra; Iman Niknia; David Pare; Brian Titus; Bruno Gagnon; Jerome Laganiere.2019. "From conventional to renewable natural gas: can we expect GHG savings in the near term?," *Biomass and Bioenergy*, vol. 131.

[18] Ueckerdt et al. 2021. "Potential and risks of hydrogen-based e-fuels in climate change mitigation". *Nature Climate Change.* https://www.nature.com/articles/s41558-021-01032-7#citeas

[19] Harvard T.H. Chan School of Public Health. May 5th 2021. "Negative impacts of burning natural gas and biomass have surpassed coal generation in many states". https://www.hsph.harvard.edu/c-change/news/gas-biomass/

[20] RMI. 2020. *Gas Stoves: Health and Air Quality Impacts and Solutions*. https://rmi.org/insight/gas-stovespollution-health

[21] Integral Group, Morrison Herschfield, E3 Eco Group. 2018. *BC Energy Step Code 2018 Metrics Research: Full Report*. Prepared for BC Housing. https://energystepcode.ca/app/uploads/sites/257/2018/09/2018-Metrics_Research_Report_Update_2018-09-18.pdf

[22] Integral Group. 2019. *Heat Pump Applications in Residential Buildings*. Prepared for: City of Richmond.

[23] See e.g. RMI. 2020. *The New Economics of Electrifying Buildings*. https://rmi.org/insight/the-new-economics-ofelectrifying-buildings

[24] ZEBx. 2021. *Construction Cost Analysis of High-Performance Multi-Unit Residential Buildings in BC*. https://www.zebx.org/construction-cost-analysis-of-high-performance-multi-unit-residential-buildings-in-bc/

[25] E3. 2019. Residential Building Electrification in California. Prepared for California Energy Commission. https://www.ethree.com/wpcontent/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf