Zero Carbon Step Code FAQs for Decision Makers

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1. **What's the difference between the Zero Carbon Step Code and Energy Step Code?**

   The **BC Energy Step Code** is a provincial standard that sets energy efficiency requirements for new buildings, grouped into 5 "steps" towards a net zero ready construction standard by 2032. (Net-zero ready means a building designed and built to be very energy efficient; the building is "ready" to be net-zero when an owner decides to install solar panels that can produce as much energy as the building consumes in a year). As of May 1, 2023, most new buildings in B.C. must meet Step 3.

   The **Zero Carbon Step Code** is a provincial BC Building Code standard which sets greenhouse gas emissions targets for new buildings. Local governments can reference it in their building or zoning bylaws and may apply different carbon performance levels, with increasing requirements.

   In short, the BC Energy Step Code targets higher levels of energy efficiency and the Zero Carbon Step Code directly targets GHG emissions.

   The four carbon performance or "emissions levels" (EL) of the Zero Carbon Step code are are:

   1. Measure-only (EL-1): requires measurement of a building's emissions without reductions and is intended to build knowledge and capacity;
   2. Moderate Carbon Performance (EL-2): in most cases, will require decarbonization of either space heating or domestic hot water systems;
   3. Strong Carbon Performance (EL-3): in most cases, will require decarbonization of both space heating and domestic hot water systems; and
   4. Zero Carbon Performance (EL-4): in most cases, will require the full electrification of a building.

   The Zero Carbon Step Code applies only to carbon pollution from space and water heating and cooking. It does not apply to wood stoves or decorative fireplaces, and is not concerned with the emissions associated with construction materials (i.e. "embodied carbon").

2. **What skills/experience needed to build to meet Zero Carbon Step Code versus Energy Step Code?**

   In general it requires more advanced skills to meet the higher steps of the Energy Step Code (ESC) than the ZCSC. This is because high efficiency homes require extra design and construction attention to ensure heat loss is minimized while also ensuring required levels of ventilation are met and overheating is prevented.

   Building to zero-carbon standards requires making a choice about what kind of equipment will be used in a building for space and water heating and cooking. In turn, this will dictate what kind of energy will be used - gas or electricity.

Many local developers, engineers, and architects are already using electric technologies, including air source heat pumps, ground source heat pumps, electric hot water heating systems, heat recovery ventilators, induction stoves, and even baseboards for high-efficiency homes. Thousands of buildings are built every year across B.C. with these kinds of technologies.

3. **How much more does it cost to build all electric homes?**

The cost of complying with energy efficiency and low carbon regulations will vary from building to building and project to project, depending on the project type, goals of the project, product availability and cost, and the decisions made during design.

A 2022 energy modeling study by the Province of B.C. explored the impact on construction costs of different building types complying with Zero Carbon Performance (EL- 4) of the Zero Carbon Step Code. Cost increases were typically below one percent, and reflect the change in capital costs of building a house (materials, labor) as opposed to the total property value which includes land value and developer profit.

The study found that cost impacts of installing a heat pump system (as a percentage) will be higher for smaller buildings; this is because smaller homes have lower total construction costs compared to larger homes. As a result, installing a heat pump system in smaller homes will be a larger proportion of total cost. However, operating costs will be significantly lower for smaller dwellings.

A 2021 analysis of construction costs of several buildings across southern B.C. found that in some cases, all-electric residential buildings have even been built for **less than the cost** of those built to minimum building code requirements. Costs will vary depending on design and experience of the team.

In residential applications where cooling is desired, installation of a heat pump, a single system that does both heating and cooling, will usually cost less than two separate units for air conditioning and gas furnace.

Furthermore, federal and provincial government carbon tax policies means that the cost of natural gas will continue to rise over the coming decade, up to $170/tonne by 2030. The cost of B.C.'s renewable electricity, meanwhile, will be unaffected by the carbon tax.

4. **What is the rush in implementing the zero carbon requirement under the ZCSC now? Why is the local government considering requiring zero carbon buildings 6 years sooner than anticipated?**

Approximately 80 percent of new buildings constructed today will still be standing in 50 years time. Every new building, therefore, represents a once in a lifetime opportunity to construct a building properly from the get go and to ensure that that building will not contribute to a community's carbon pollution emissions.

The Government of B.C. is pursuing a policy that will effectively require every space and water heating system installed after 2030 to include a heat pump. Requiring a new building to be zero carbon today will help to ensure that these buildings will be compliant with this requirement when it comes time to replace their heating systems and avoids the additional future cost and time it would take to retrofit a fossil fuel system to one with a heat pump.

It is considerably more straightforward to design and build a new building to be zero carbon than it is to retrofit to zero carbon requirements one after it is built. So requiring a building to be zero carbon now can save higher costs down the road.

Over time as more existing homes make the switch to electric heating equipment and new ones are built to the Zero Carbon Step Code, there will be fewer customers to pay for the gas infrastructure. As a result, gas utilities could choose to increase bills of remaining customers to cover infrastructure costs.

5. **How much does it cost to retrofit a home with a gas furnace and hot water to electric systems versus installing electric systems at time of construction?**

   For retrofitting - typically an electric heat pump system costs one to five times more than replacing an existing natural-gas heating system.

   The costs for retrofitting are typically lower for single family homes where installation is simpler. Multi unit residential buildings (MURBs) are more complex, as the capital costs of switching depend on the existing equipment, building use and design.

   BC Hydro and many local governments offer financial support to retrofitting heat pumps in residential buildings

   For new buildings, full electrification is typically the cheaper option because builders can avoid the costs of the main gas hookup, piping, and exhaust flue(s). In residential applications where cooling is desired, installation of a heat pump will usually cost less than installing a separate air conditioner and gas furnace.

6. **Will we run out of electricity? I heard we don't have enough electricity to meet our needs.**

   BC Hydro has a surplus of clean electricity that is expected to last until at least 2029, with Site C bringing additional supply to the grid from 2025. This represents a unique opportunity to rapidly increase electrification in B.C. over the next decade.

   The provincial government and BC Hydro are working to accelerate electrification across B.C. in order to meet the goals of CleanBC, the province's climate plan. To this end, in June 2023, BC Hydro announced that it plans to build wind and solar projects that will

provide an additional 3,000 gigawatt hours of energy. These projects are expected to be generating electricity beginning in 2029. Additional projects are expected to be built over the coming years and will be timed to ensure that they align with growing demand.

Energy efficiency is also a critical resource for reducing energy use wherever possible, and for getting more out of every unit of electricity generated in the province. For example, an electric heat pump uses 2 to 3 times less energy than a high efficiency natural gas furnace or electric baseboard. So only 33 percent to 50 percent of the energy is needed to heat a home with an electric heat pump as it would take to heat it with conventional gas or electric equipment. This means less total energy is needed to do the same level of work.

7. Does BC Hydro have enough power to cover its peak winter demand?

Yes, BC Hydro is able to meet 100 percent of its peak demand. In fact, since 2016, the Clean Energy Act's self-sufficiency clause has required BC Hydro to secure enough electricity generating facilities within British Columbia to meet its mid-level (or Reference) load forecast.

As an added layer of precaution, when calculating its generation capacity, BC Hydro subtracts 12 percent of its total system dependable capacity to ensure that it also has a capacity reserve. The capacity reserves means that in a year with average or greater water inflows, our system has the capacity to produce a surplus of electricity. This surplus is exported to other jurisdictions in the Western Interconnection grid (such as Alberta, California, Oregon and Washington).

In addition to selling B.C.'s surplus power, BC Hydro, through its trading subsidiary, Powerex, also purchases power from the wholesale electricity market. By buying electricity when prices are low, Powerex helps BC Hydro to conserve water in its reservoirs for periods of high demand, like during the winter months.

8. Doesn't BC Hydro import "dirty" electricity from other jurisdictions?

BC Hydro's electricity system is part of the Western Interconnection – a network of high-voltage transmission lines that connects B.C. with other utilities, including those in Alberta, Washington State, Oregon and California.

While BC Hydro's system is planned and built to generate a surplus of electricity, BC Hydro's trading subsidiary– Powerex – buys and sells power with its trading partners in western North America.

The electricity that is imported into B.C. can come from a number of different sources, including wind, solar, hydroelectric, nuclear, natural gas, or even coal. In recent years, however, more and more renewables, like solar, have become available on the market from places like California.

The price of electricity fluctuates depending on the amount of supply and demand. For example, solar generation is highest during mid-day. High volumes of solar energy available on the market results in low prices. Powerex will often purchase power during these times at a much lower cost, and at times is paid to take the excess electricity.

Clean renewable energy that can be traded between jurisdictions (including importing from California to B.C. or from B.C. to Alberta) means more clean energy. For example, one of B.C.'s electricity trading partners is Alberta. While it is one of our closest neighbours, electricity imports from Alberta represent just three percent of all imports into B.C. B.C. exports six times as much electricity as it imports from Alberta, which helps to substantially reduce greenhouse gas emissions in that province.

To ensure that B.C. retains enough clean electricity for its domestic use, Powerex has adopted a Clean Energy Trading Standard. The Standard limits Powerex to trade only the quantity of environmental attributes (e.g., clean electricity credits) that are in excess of domestic retail sales over a four-year period. This means that over any four-year period 100 percent of B.C.'s domestic electricity retail sales will be clean from a GHG perspective.

9. Will there be enough locally available electricity?

BC Hydro continues to improve and make upgrades to its transmission and distribution systems, so electricity can be transferred consistently from where it is generated to where it is needed across the province.

There are hundreds of BC Hydro capital projects underway that, together, make up one of the largest expansions of electrical infrastructure in the province's history. This includes the installation of new 'feeders' in the distribution system to deliver electricity to local areas undergoing rapid development. Across the province, BC Hydro have added 35 new feeders in the past five years, have 18 under construction, and are building about 130 kilometres worth of underground utility corridors.

BC Hydro is also proposing to install up to 800 megawatts of battery storage at a local level by 2032, which will help manage peak demand for electricity.

10. Are heat pumps really a climate-friendly option if they rely on hydrofluorocarbons (HFC), which is a greenhouse gas?

Hydrofluorocarbons (HFC) have been commonly used for many years as a refrigerant in heat pumps and other equipment such as refrigerators and freezers.

HFCs have a high global warming potential (GWP). Proper installation and maintenance of equipment using refrigerants, along with proper recycling of refrigerants at the end of an equipment's useful life will help to avoid harmful refrigerant leaks. Estimates on

refrigerant leakage during use vary, but are below 10 percent per annum depending on the system. Leakage during decommissioning may be higher.

Alternative refrigerants with lower GWP are appearing on the market. Canada is planning a reduction in HFCs use of 85 percent by 2036 and the BC Building Electrification Roadmap contains a series of strategic actions to phase out HFC use in heat pumps over the next 10 years.

Finally, even with current HFCs, refrigerant leaks from heat pumps have lower lifetime GHG emissions compared to operating an equivalent natural gas heating system.

11. Does the highest level of the Zero Carbon Step Code effectively ban the use of natural gas in homes?

The Zero Carbon Step Code is not a ban on natural gas but it does significantly reduce the amount of natural gas used in a new home and will therefore significantly reduce the GHGs emitted over the lifetime of that home.

For “Part 9” buildings (such as single family homes and townhouses), the Zero Carbon Step Code gives builders the option of choosing performance- or prescriptive-based carbon emission requirements. The performance option allows for the use of fossil natural gas for cooking and ancillary heating (e.g., natural gas fireplace). The performance path even allows for the use of hybrid heating systems (i.e., an electric heat pump paired with a gas furnace) - even at the highest level - provided the home’s GHG emissions limits are not exceeded. The prescriptive option does not allow the use of fossil natural gas for cooking but it does permit the use of ancillary heating such as decorative natural gas fireplaces.

For Part 3 buildings (such as mid- and high-rise apartment buildings), GHG emissions from natural gas cooking equipment and decorative fireplaces are accounted for in the building’s GHG intensity calculations. Although the Zero Carbon Step Code does not exclude the use of this equipment, practically, buildings that use natural gas cooking equipment or decorative fireplaces will be more challenged to meet the Level 4 zero carbon intensity target.

12. Can renewable natural gas be used to comply with the Zero Carbon Step Code? It seems like it’s a good source of renewable energy that diverts organic waste.

The Zero Carbon Step Code allows local governments to decide if they want to recognize renewable natural gas (RNG) as a compliance option. No mechanism currently exists that allows Fortis to guarantee 100% RNG for the life of a building, but Fortis has applied to the B.C. Utilities Commission for a 100 percent RNG rate for new residential buildings. Some jurisdictions have opposed the proposed rate because of the degree that existing customers would be cross-subsidizing new customers.

Renewable natural gas (RNG) is made by capturing methane from biogenic sources such as organic landfill or agricultural waste to ensure this methane is not released into the atmosphere and is therefore considered avoided emissions.

There are significant constraints on the amount of RNG available from B.C.and there are documented health risks associated with using gas indoors.

A Natural Resources Canada-commissioned study suggests that feasible supply of RNG available in the country could only meet 3.3 percent of total current gas demand in Canada.

An analysis of RNG potential specifically in B.C. found that biomethane from within B.C. could meet around 4 percent of B.C.'s total gas demand in 2032 (less than 10 petajoules or RNG; current demand in B.C. is nearly 230 PJ in 2021). As a result of very limited supply, B.C.'s gas utilities will buy credits for biomethane that is produced and used elsewhere (e.g. Ontario or the US), and pass along the "benefit" of biomethane to their B.C. customers.

13. Is heating with natural gas cheaper than electricity?

All-electric heat pump systems are more efficient than natural gas heating systems (typically 2-3 times more efficient) and, therefore, result in energy savings.

Whether the energy savings translate to energy cost savings is dependent on several factors, including the price of electricity, the price of natural gas, the efficiency of the heat pump system (which varies with outdoor air temperature and therefore climate/location), and the efficiency of the building.

Evidence suggests homes heated with a heat pump generally have similar or lower utility bills than those heated with natural gas. A recent study of Vancouver Island and the Lower Mainland heat pump users who recently switched from natural gas noted at current utility costs (including any usage at Tier 2 rates, see Question 14 below) and carbon tax rates, heat pumps resulted in the same or lower costs in the majority (nearly 70 percent) of participating homes.

The cost savings is because buildings that are well insulated and sealed keep warm air inside in the colder months, while keeping warm air outside in hotter months. High efficiency equipment like heat pumps use far less energy than traditional gas furnaces and separate air conditioning units, which translates to lower overall energy costs.

The provincial government and BC Hydro are working to accelerate electrification across B.C. in order to meet the goals of CleanBC, the province's climate plan. It is anticipated that a review of rates to support affordable electrification is part of this work.

14. **Do heat pumps work in the winter? I heard they don't, and that's why we need gas back up during storms and extreme weather.**

    Heat pumps work in cold weather - and the technology continues to improve. Cold climate heat pumps are built to work efficiently in conditions down to -25°C, with some systems maintaining an efficiency of over 200 percent at -18°C. Since the air outside will always contain some heat, a heat pump can supply heat to a house even on cold winter days.

    Many modern high efficiency heat pump systems come with an integrated electric resistance heating system that functions as a supplementary heating source at low temperatures.

    In most climate zones in B.C., especially for the Lower Mainland, Vancouver Island and Coastal regions, there would be no need to install a supplemental heating system if the right heat pump is selected.

    In colder climates, a high efficiency building envelope will help to mitigate the need for a supplemental heating system.

    Ground-source heat pumps can operate efficiently in colder climate regions because they take advantage of warmer and more stable ground temperatures.

15. **If gas stoves are not permitted, how might this affect the cooking methods that typically involve an open flame?**

    For Part 9 buildings (such as single family homes and townhouses), the Zero Carbon Step Code gives builders the option of choosing performance- or prescriptive-based carbon emission requirements. The performance option allows for the use of fossil natural gas for cooking. The prescriptive option does not allow the use of fossil natural gas for cooking.

    For Part 3 buildings (mid- and high-rise apartment buildings), GHG emissions from natural gas cooking equipment are included in a building's total GHG intensity calculation. So although it is possible for a zero carbon building to include gas cooking, in practice, it will make it more challenging to meet the zero carbon GHG intensity target.

    Decision makers should consider the adverse impacts that gas appliances have on indoor air quality and health. Several studies have shown that gas appliances may produce unsafe levels of nitrous oxide, carbon monoxide, fine particulate matter, and methane leaks.

16. **Will going to all electric space and water heating push homeowners and tenants into Tier 2 pricing? This will make it more expensive/unaffordable to live in an all electric home.**

BC Hydro customers are charged one rate for electricity use up to a certain threshold (Tier 1 rate). Usage that exceeds this threshold is charged at a higher rate (Tier 2 rate). This rate structure was initially created to encourage conservation.

All electric homes do have a greater chance of moving into a Tier 2 residential electricity rate for a portion of their home's energy use.

A high efficiency building that requires less energy to heat will minimize how much energy is charged at a Tier 2 rate if it does exceed the Tier 1 threshold.

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BC Hydro is seeking approval from the B.C. Utility Commission to offer residential customers the option to sign up for time of use billing. If approved, residents who voluntarily sign up for this option could reduce their electricity bills by shifting electricity use to off-peak periods. For example, doing laundry and dishwashing during off peak periods and charging EVs overnight.

17. **Rural communities face issues with grid security, what will happen to our homes if electricity goes out? What options are there for distributed power generation as back up?**

    There is a misconception that relying solely on electricity puts customers at greater risk in the case of a power outage than having both natural gas and electricity. In general, gas heating systems will not operate during a power outage as they use components that require electricity to operate, including circuit boards, relays and blower motors and fans.

    Additionally, as the efficiency of homes and buildings improves, they are able to remain warm or cool for longer in the event of a power outage. Large buildings and critical infrastructure are also required to have a backup generator (regardless of the building's energy source) to keep occupants safe in the case of power outages.

    For smaller "Part 9" homes and buildings (e.g., single family and townhomes), the Zero Carbon Step Code provides some provisions for the use of ancillary heating sources such as decorative natural gas fireplaces, provided they are not designed to accommodate the entire heating load of the building.

The ZCSC does not preclude the use of distributed power generation, battery storage, and generators which could be used in the case of an electrical grid outage.

BC Hydro routinely reports on grid reliability, using average customer interruption duration, across the four main regions. Regional reports can be found here[1].

18. Will the ZCSC add another requirement that will slow down the local government's ability to deliver housing faster?

The ZCSC is designed to allow local governments to implement it seamlessly alongside existing permitting practices.

For homes and buildings that follow the performance based modeling approach to demonstrate compliance with the Energy Step Code, the same model can be used to demonstrate compliance with the ZCSC.

For homes that follow the prescriptive pathway to demonstrate compliance, an inspector only needs to check that the installed equipment is electric to verify compliance with the ZCSC.

For homes that are all electric, the absence of natural gas means no gas permitting/inspection is required, potentially reducing permitting times.

[1] Page 10 Lower Mainland, Page 11 Vancouver Island, Page 12 southern Interior, Page 11 Northern Region