

TO: CHAIR AND MEMBERS
SUSTAINABLE CITY ADVISORY
COMMITTEE

DATE: 2018 November 7

FROM: DIRECTOR PLANNING AND BUILDING

FILE: 76500 20
Reference: Green Building Policy

SUBJECT: GREEN BUILDING REQUIREMENTS FOR NEW PART 3 BUILDINGS

PURPOSE: To seek Council's approval for the proposed green building requirements for new Part 3 buildings and to update Council on the status of policy development for other building types.

RECOMMENDATIONS:

1. **THAT** Council approve the proposed green building requirements for new Part 3 buildings, and authorize the preparation of the necessary Bylaw amendments, as outlined in this report.
2. **THAT** Council receive the updates on the status of policy development in progress, and planned future policy development, for other types of buildings, as outlined in Section 5 of this report for information.

REPORT

1.0 INTRODUCTION

The report to the Sustainable City Advisory Committee dated 2018 February 06, approved by Council on 2018 February 26, outlined the context and process for developing policy to improve the environmental performance of new buildings in Burnaby, in support of Burnaby's approved sustainability policies and greenhouse gas (GHG) reduction targets. The green building policy is to focus primarily on energy efficiency and reducing GHG emissions, and to consider secondary environmental objectives. The first phase of work is focusing on larger buildings, defined in the BC Building Code as Part 3 (with residential, business, personal services or mercantile occupancies). Smaller residential buildings, defined in the BC Building Code as Part 9, and City buildings, will be addressed in future work.

The purpose of this report is to advance a proposed policy framework, including requirements for new Part 3 buildings, for Council's consideration, and to report on the status of ongoing policy development for the other building types noted above.

2.0 POLICY FRAMEWORK

2.1 Burnaby Strategic Plans

As outlined in the previous SCAC report (dated 2018-02-06), green building policy is aligned with the City's three sustainability plans (environmental, social and economic):

- The 2016 **Environmental Sustainability Strategy** (ESS) and **Community Energy and Emissions Plan** (CEEP), including the *Breathe, Build* and *Manage* goals and specific strategies and actions to improve the environmental performance of buildings. The CEEP also includes adopted targets for reducing community greenhouse gas (GHG) emissions.
- The 2011 **Social Sustainability Strategy**, with opportunities to improve affordability with reduced energy costs, and improve occupant comfort and health through more efficient building design and heating, ventilation and air conditioning systems.
- The 2007 **Economic Development Strategy**, to support Burnaby's green economy and the sustainability of businesses in Burnaby.

The proposed green building policy also aligns with the following goals and sub-goals of the **Corporate Strategic Plan**:

- **A Healthy Community**
 - Healthy Life – encourage opportunities for healthy living and well-being.
 - Healthy Environment – enhance our environmental health, resilience and sustainability.
- **A Dynamic Community**
 - Economic Opportunity – Foster an environment that attracts new and supports existing jobs, businesses and industries.
 - Community Development – Manage change by balancing economic development with environmental protection and maintaining a sense of belonging.

2.2 Provincial Policy and Building Code

The provincial Climate Leadership Plan identifies a goal for all buildings to be Net Zero Energy Ready¹ by 2032, in order to conserve energy and reduce carbon emissions.

As outlined in the Council report dated 2017-01-23, Burnaby is a signatory to the provincial Climate Action Charter, which includes a commitment to reducing and measuring corporate and community GHG emissions.

¹Net-zero energy ready means that energy use is reduced to the extent that all the building's energy needs could be supplied by on-site renewable energy (e.g. solar).

The BC Building Code (BCBC) has required energy efficiency since 2008. Current BCBC requirements are typically met by adhering to specific types/standards of insulation, wall assemblies and windows (a “prescriptive” approach), to achieve greater energy efficiency. In 2017, an option for compliance with a “performance path” was added to the BCBC, in the form of a framework (Energy Step Code, ESC) which local governments could adopt. The stated objectives of this framework are to improve consistency in green building requirements among local governments, to foreshadow future BCBC updates, and to work toward a goal of net-zero energy ready buildings by 2032. More details about the BCBC and development of the framework are provided in the previous SCAC report.

This new framework applies to two categories of buildings as defined in the BCBC, depicted below.



Part 9 residential buildings include single, two-family, attached and apartment buildings up to three storeys and 600 square metres in footprint or less.



Part 3 buildings - residential or business and personal services or mercantile occupancy (“commercial”) buildings larger than three storeys or 600 square metres in footprint, and include apartments, offices, shopping centres, hotels, and some mixed-used buildings.

The policy recommendations focus only on Part 3 (multi-family) residential and business and personal services or mercantile occupancy buildings (called “commercial” in this report). The Province is in the process of developing standards for public sector buildings, including hospitals, schools, colleges, care facilities, libraries and recreation centres, which are expected to be released in 2019. Accordingly, recommendations for adopting requirements for these additional building types may be advanced for Council’s consideration in future.

3.0 PROPOSED GREEN BUILDING POLICY FOR PART 3 BUILDINGS

The proposed policy approach, as outlined below, is also summarized graphically in **Appendix A**, and additional technical details are provided in **Appendix B**.

3.1 Why it Matters

Green building policy is important for a variety of reasons, including:

- Nearly half (45%) of the city’s community GHG emissions come from heating and cooling buildings.
- Energy efficient buildings cost less to heat and cool and are more comfortable.
- Buildings that use less resources, renewable energy systems and sustainable materials support a healthy environment.

- Buildings can last for many decades, so good design at the outset can save a lot of cost in energy and avoid improvements over time.
- Making existing and new buildings more "green" helps to support the economy, creating jobs as well as markets for innovative technology and materials.
- Energy efficient homes support health and affordability, especially for low income households that spend a greater proportion of their income on energy.
- Efficient and low-carbon buildings help us take action on climate change and meet the carbon targets adopted in Burnaby's Community Energy and Emissions Plan.

3.2 Building on Burnaby's Success

Today, Burnaby has many examples of green neighbourhoods and green buildings, including:

- Burnaby's award-winning UniverCity, a sustainable community that's home to over 4,000 people, has had green building requirements since 2010. They include energy and water conservation, rainwater management, native plants, and connection to a district energy system that will be fueled by carbon-neutral waste wood.
- A number of recent large developments, including Solo in Brentwood Town Centre, have low-carbon energy systems that use heat from the ground or the air to heat and cool the buildings, reducing carbon emissions by up to 80 percent compared to a standard development.
- City facilities including Edmonds Community Centre, Tommy Douglas Library, and the new South Burnaby Ice Arena (will) have many green features that save energy and water, and reduce operating costs.

3.3 Proposed Green Building Policy Components

Burnaby's ESS and CEEP include the long-term goal of "Buildings and infrastructure that have a positive impact on the environment", along with supporting strategies and actions that define achievable steps to make progress toward this goal. The proposed green building policy for Part 3 buildings consists of five key components that are supported by the applicable strategies and actions of the "Build" goal of the ESS and CEEP, as outlined below.

- ✓ **Energy modeling and air tightness testing** for all new buildings
- ✓ **Higher energy efficiency** requirements for buildings subject to rezoning
- ✓ **Flexibility** in energy efficiency performance requirements **to encourage low carbon energy** systems
- ✓ **Low carbon energy system policy** that supports a variety of efficient, cost-effective and properly maintained systems at the neighbourhood and building scale
- ✓ **Monitor and report energy use** over time (energy benchmarking) for all new Part 3 buildings

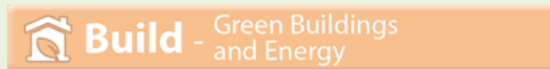
Each of these components is described below.

3.3.1 Energy Modeling and Air Tightness Testing

Proposed green building policy component:

✓ **Energy modeling and air tightness testing for all new buildings**

Supported by the approved ESS & CEEP:



*ESS 6.1, CEEP C3.1 – Big Move in Progress: **Meet updated energy performance building code requirements for new buildings***

ESS suggested action and associated Quick Start:

b) Explore working with designers, builders, energy professionals, industry and the province to identify opportunities to optimize building code compliance.

Quick Start #14 – Review issues and possible opportunities to improve compliance, such as with requirements for review of development proposals by an energy professional.

Energy modeling, which is becoming a common practice for larger buildings, involves using software to predict the energy used and (if required) GHG emitted annually, based on the design of the building's features and energy systems. Where specific energy efficiency performance targets are required, as proposed for Burnaby's green building policy, energy modeling is typically the method used to demonstrate compliance, along with air tightness testing.

Achieving higher levels of energy efficiency requires more air-tight buildings (while noting that fresh air is still delivered through efficient ventilation systems). Testing of air tightness can be done when construction is nearly complete and before occupancy, and helps to check some of the assumptions used in energy modeling². The methodology for air tightness testing is well established, and some jurisdictions have had requirements for testing (and in some cases meeting specific targets) for many years.

Burnaby's proposed green building policy would require **energy modeling and air tightness testing for all new Part 3 buildings**. For rezoning, where specific energy or GHG performance standards would be required, as outlined in the sections below, the outcomes from the modeling and testing would be used to demonstrate compliance, through submission to the City of a report signed by an energy professional. See also *Section 4.2.3*.

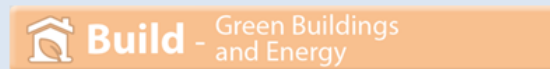
²Testing *after* occupancy is not ideal for compliance since occupant behavior can greatly affect the actual energy use.

3.3.2 Higher Energy Efficiency

Proposed green building policy component:

✓ **Higher energy efficiency requirements for buildings subject to rezoning**

Supported by the approved ESS & CEEP:



*ESS 6.2, CEEP C3.2 – New Big Move: **Improve building design and construction to meet higher levels of environmental performance***

CEEP suggested action and associated Quick Start:

- a) *Consider policy approaches to encourage higher levels of energy efficiency than required in the BC Building Code, and reduced GHG emissions, in new larger (Part 3 BCBC) buildings, including: alignment with provincial Building Act and Step Code; integration with existing City development application policy; incentives such as grants for innovative projects.*

Quick Start #15 – Develop policy recommendations for encouraging higher performing buildings through the City’s development application process, based upon provincial Step Code or other appropriate performance-based criteria.

Burnaby has used various approaches to seek higher standards of environmental performance through development review, including applying a standard equivalent to LEED Silver³, UniverCity’s green building requirements, and other standards for energy efficiency pursued by developers on their own initiative. Collectively, these approaches have demonstrated that higher standards of energy efficiency, using a variety of approaches, are both feasible and marketable.

Based on these prior experiences, new and up to date standards and approaches have been developed that reflect the more advanced state of practice of the green building industry today. Input regarding the proposed standards for energy efficiency has been garnered from energy professionals and development stakeholders, both regionally during development of the provincial framework, and in Burnaby specifically during consultation on Burnaby’s approach to energy and green building design.

For Part 3 buildings subject to rezoning, Burnaby’s proposed green building policy would require higher levels of energy efficiency, with the requirement of specific performance standards dependent on whether or not a low-carbon energy system was implemented, as discussed in the following section and as outlined in more technical detail in **Appendix B**.

³The LEED™ standard, administered by the Canada Green Building Council, is based on points allocated for design features, and one of the drawbacks is that many developments can accrue points for factors such as proximity to transit, without necessarily addressing energy efficiency specifically.

3.3.3 Flexibility to Encourage Low Carbon Energy

Proposed green building policy component:

- ✓ **Flexibility** in energy efficiency performance requirements to encourage low carbon energy systems

Supported by the approved ESS & CEEP:



ESS 6.6, CEEP C3.6: Encourage a shift to renewable energy for buildings where possible

ESS suggested action:

- a) Encourage the use of renewable energy on large site developments as a component of a green energy opportunities review.*

Nearly half (45%) of the Burnaby's total community GHG emissions come from heating and cooling buildings, and reducing these emissions is critical for meeting Burnaby's community GHG targets. Therefore, it is important to increasingly shift toward the use of low-carbon, renewable energy, in addition to improving energy efficiency as outlined above. Fortunately, there are a variety of approaches and technologies available to support this shift.

While energy use and emissions can and should both be reduced in an integrated manner, allowing some flexibility in energy efficiency standards to encourage low carbon energy can reduce upfront costs of these advanced systems, make the choice of a low-carbon energy system more feasible, and create more options for designs that may be appropriate for different sites. For example, a particular site may be ideally suited to a geo-exchange system due to the geology. On another site, the designer may want to pursue an architectural design that lends itself more easily to a highly efficient building envelope. The proposed approach would allow for choices that support multiple objectives including creative urban design, energy efficiency, and reducing GHG emissions. This approach was vetted and well supported by the development industry and low carbon energy system providers consulted in development of the proposed policy.

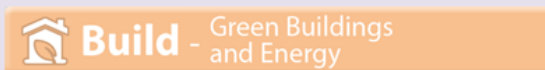
For Part 3 buildings subject to rezoning, Burnaby's proposed green building policy would allow buildings that implement an approved low-carbon energy system to meet an energy efficiency level that, while still a significant improvement over current minimum standards, is slightly lower than would otherwise be required. The specific proposed energy performance requirements, GHG limits and low carbon energy system details are outlined in **Appendix B**.

3.3.4 Low-carbon Energy System Policy

Proposed green building policy component:

- ✓ **Low-carbon energy system policy** that supports a variety of efficient, cost-effective and properly maintained systems at the neighbourhood and building scale

Supported by the approved ESS & CEEP:



CEEP C3.5, ESS 6.5: Investigate district and energy sharing opportunities and encourage their development in appropriate locations

CEEP suggested actions:

- a) *Explore developing policies to encourage or require investigation and development, where appropriate, of District Energy systems in new developments.*
- b) *Explore opportunities to use existing waste heat sources for District Energy systems.*

The proposed low-carbon energy system policy outlines criteria for approvable systems in support of the flexible option for energy efficiency performance as outlined in Section 3.3.3, and would include district and energy sharing systems, as referenced in the ESS and CEEP, as well as building-scale low carbon systems. For the purpose of Burnaby's proposed green building policy, a **low-carbon energy system** (LCES) is defined as *a professionally operated and maintained, highly efficient mechanical system that supplies a building's space heating, cooling and domestic hot water heating demand primarily from renewable energy sources, and meets defined GHG limits.*

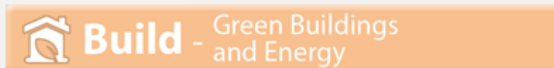
LCES technologies include, but are not limited to, air and ground source heat pump systems, waste heat recovery systems, biomass and solar energy systems, all of which have previously been implemented in Burnaby and neighbouring municipalities. A LCES can be implemented at the scale of a single building, multiple buildings on a single site (such as the geothermal system at the Solo development in Brentwood Town Centre), or to service a neighbourhood (such as the Corix-owned neighbourhood energy utility at SFU). LCES can significantly reduce GHG emissions and be cost-effective for users. For example, the Corix neighbourhood energy utility at SFU is expected to reduce emissions from both the campus and residential development by 80%, and has been well supported by residents and buyers. More technical details about LCES are outlined in **Appendix B**, and additional technical policy criteria are outlined in an LCES policy available in the Planning and Building Department that would be provided to applicants, to support the provisions outlined in Sections 3.3.2. and 3.3.3.

3.3.5 Monitor and Report Energy Use

Proposed green building policy component:

- ✓ **Monitor and report energy use over time (energy benchmarking) for all new Part 3 buildings.**

Supported by the approved ESS & CEEP:



CEEP C3.3: Develop policies and programs to measure and communicate how much energy a building uses, for example using energy audits and EnerGuide labels and/or energy benchmarking

CEEP suggested action:

- c) Consider developing policy to encourage energy benchmarking (measuring and comparing energy performance) for new and existing commercial and institutional buildings.*

Energy benchmarking (tracking and reporting energy use) is a simple and low-cost action that can provide valuable information for monitoring implementation of the green building requirements at a community scale, and encouraging energy efficient operations by building owners. It addresses the maxim that “what gets measured gets managed”. Energy benchmarking would be an administrative requirement for all new Part 3 buildings, in which the building designer would set up an account through a free online reporting tool (Energy Star Portfolio Manager), the City would be designated as a reviewer of the account, and energy usage data from linked utility accounts would occur annually and for the most part automatically. More information is provided in **Appendix B**.

4.0 CONSULTATION AND IMPLEMENTATION

4.1 Consultation

In developing the proposed green building policy and requirements, staff engaged with representatives from the development industry, including the Urban Development Institute and architects and engineers active in Part 3 building development in Burnaby. Several meetings and workshops were held and an online questionnaire was circulated to these stakeholders to seek further specific feedback and input. The proposed framework was adjusted in response to concerns including costs, design challenges and the need for timelines sufficient for the industry

to prepare, and circulated to additional stakeholders⁴. Response to the revised framework, as reflected in this report, was generally supportive. As such, the proposed approach is believed to offer a good balance between the interests of the development industry, those of building occupants and ratepayers, and community sustainability goals.

4.2 Implementation

4.2.1 Bylaw Requirements: Energy Modeling and Air Tightness Testing

The proposed requirements for energy modeling and air tightness testing, applicable to all new Part 3 buildings, would be advanced as a Building Bylaw amendment (referencing a requirement to conform to Part 8 of the National Energy Code for Buildings, as noted in ***Appendix B***). Upon Council adoption, all new Building Permits issued for applicable Part 3 buildings would be required to meet the amended Bylaw.

4.2.2 Rezoning Requirements: Higher Energy Efficiency, Flexibility for Low-carbon Energy Systems (LCES), LCES Policy and Energy Benchmarking

Standards for higher levels of energy efficiency, and flexible provisions and policy supporting low carbon energy systems would be implemented through the rezoning review process, and considered to be requirements of Council with approval of this report. Energy benchmarking would be considered an administrative requirement of rezoning. The specific framework and technical details of these requirements are further outlined in ***Appendix B***.

These rezoning requirements are proposed to take effect on 2019 July 1, the date conveyed to stakeholders in May 2018. This timeline is intended to give industry enough lead-time to prepare and adapt to new practices. At that time, new applications would be required to comply, except for rezoning applications that have already advanced past Second Reading. This is to account for the possibility that buildings that have advanced to a more detailed design stage may have difficulty complying with the new requirements. Rezoning applications received in the interim will, however, be encouraged to comply with the proposed policy framework if feasible.

4.2.3 Compliance

Compliance with all requirements as outlined in this report would be ensured primarily through reliance on qualified professionals. Energy modeling of the building's energy and GHG performance (if applicable) would be signed off by a professional engineer and a report would be submitted to the City that documents that the building meets or exceeds the City's requirements. Air tightness testing would also be required when the building is nearing completion, as air leakage rates would need to validate the energy modeling. Submission of a final report

⁴The proposed policy was circulated to stakeholders including: individual industry professionals previously engaged, Urban Development Institute, Commercial Real Estate Development Association, Building Owners and Managers Association of BC, FortisBC, Fortis Alternative Energy Services, Smartforme, Corix, BC Hydro, BC Institute of Technology, Greater Vancouver Home Builders' Association, Metro Vancouver, the BC Building Safety Standards Branch, BC Housing, Engineers and Geoscientists BC, Architects of BC, Burnaby Board of Trade, and the Federation of Canadian Municipalities.

confirming the targeted energy efficiency, GHG limits and LCES criteria (if applicable) have been met would be a condition of the issuance of an occupancy permit.

4.2.4 Next Steps

Upon Council's approval of this report and prior to the proposed requirements coming into effect, staff would undertake the following:

- Work with the City Solicitor to advance the necessary Bylaw amendments to implement the requirements for energy modeling and air tightness testing at the earliest opportunity.
- Develop resources as needed to further clarify application submission and compliance requirements.
- Communicate the pending policy requirements, and outline development application submission requirements to the development industry and on the City's website.
- Ensure staff have appropriate knowledge to process applications in line with the new requirements.

4.2.5 Monitoring and Updating the Green Building Requirements

Staff will monitor the implementation of the proposed green building requirements in new Part 3 development, including the general response of the market and industry, stakeholder feedback, the regulatory framework at provincial and federal levels, and specific outcomes and achievements. As noted above, energy benchmarking will also be used for monitoring general outcomes. In future, both minor adjustments and more significant updates are anticipated in order to respond to this dynamic sector and ensure progress toward the City's sustainability goals.

5.0 FUTURE PHASES OF GREEN BUILDING POLICY DEVELOPMENT – OTHER BUILDING TYPES AND ENVIRONMENTAL OBJECTIVES

5.1 Part 9 Buildings

Single and two-family homes, attached homes and low-rise apartments up to three storeys and less than 600m² in footprint (Part 9 in the BC Building Code) account for a significant proportion of the City's housing stock, energy use and GHG emissions. Development of green building policy for these buildings would be initiated in early 2019, and would include engaging builders in this sector. Proposed communication and engagement approaches may be modeled on successful approaches already undertaken in other jurisdictions.

5.2 Other Environmental Objectives

As outlined in previous reports to Council, energy and GHG emissions were identified as the highest priorities for Burnaby's green building policy. However, additional important environmental objectives can also be achieved through new building design and construction, such as water conservation, construction and demolition waste reduction, sustainable (i.e. recycled, low-carbon, low-emitting) building materials and finishes, and ecosystem/site

protection and enhancement. Specific metrics and requirements in such areas may be defined for future green building policy updates. In the meantime, the approved Environmental Sustainability Strategy and existing supporting policy will be referenced to address these and other opportunities. Through the development review process, proponents of large buildings are already asked to prepare a submission outlining how their project addresses and responds to the specific and relevant goals, strategies and actions of the ESS. Opportunities may be further considered to standardize or formalize this process to enhance clarity and consistency.

5.3 City Buildings

Development of the City's own buildings offers an important opportunity to demonstrate leadership in sustainability, foster learning, and support the green building industry. Burnaby has previously implemented green features in civic buildings, including geothermal heating at the Tommy Douglas library, and solar thermal heating of the pool at Bonsor Recreation Centre. With Council's approval in 2016 of the ESS and CEEP, signing the Climate Action Charter in 2017, and now introduction of ESC and Burnaby's green building policy, there is an opportunity to build on these previous successes and demonstrate next-level leading energy and GHG performance, and to seek opportunities for long-term operational cost savings.

The City's approved ESS and CEEP, and the implementation plan approved by Council in 2017, identify corporate sustainability, including in development of new City buildings, as a high priority and part of Phase 1 implementation. A "Quick Start" in support of ESS Manage goal 10.3 also notes that the City will *"review upcoming civic building projects for opportunities to demonstrate energy-efficient passive design and net-zero-energy."*

City administrative buildings would need to meet the green building requirements for Part 3 office buildings. Other building types do not have defined provincial energy performance targets, however some are in development for public sector buildings, including recreation centres and libraries. Pending review, these targets may be applied to the development of such facilities. Other building types without defined energy performance standards, such as ice rinks and fire halls, may require a different approach to address their unique uses and energy and GHG considerations.

In general, new City buildings would be intended to target an achievable standard appropriate for the building type, and in consideration of costs, benefits, design and building use, while demonstrating leadership in accordance with Council's direction noted in the ESS and CEEP. Future work and reports to Council will be undertaken to advance further specific policy and practice in this area, in support of the City's commitment to sustainability.

5.4 Existing Buildings

In future, approaches to encourage energy efficiency retrofits for existing buildings will be considered, as supported by the ESS and CEEP. Possible approaches may include, but are not limited to, energy benchmarking requirements, energy efficiency requirements for significant renovations, education campaigns, incentive programs, demonstration and pilot projects, and profiling and celebrating successes and leadership. These initiatives could include the City

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playing a lead and/or supporting role, along with partnerships with agencies such as utilities, BC Housing, and other levels of government. Policy and/or programs for existing buildings would be considered and advanced for Council's consideration at a later date, following completion of green building policy for Part 9 buildings.

6.0 CONCLUSION

This report sets out a proposed green building policy framework for new Part 3 buildings in Burnaby that can reduce GHG emissions by 70% or more, lower energy use and costs, and improve health and comfort for building occupants.

Building on past successes, Council's approval of the Environmental Sustainability Strategy (ESS) and Community Energy and Emissions Plan (CEEP), together with the introduction of an updated provincial framework, have helped set the stage for the next generation of leadership in green buildings in Burnaby. The proposed approach outlined in this report was based on consideration of a range of relevant issues, available research and consultation with stakeholders including professionals in buildings and energy systems design, developers, other local governments and the Province. The new standards for rezoning would come into effect 2019 July 1 for new Part 3 buildings, and basic requirements for energy modeling and air tightness testing would apply as soon as Bylaw amendments are approved, in early 2019.

This report also proposes to develop, in future, requirements for Part 9 residential buildings, which include single family homes and multi-family homes up to three storeys, and policy for City buildings to demonstrate leadership.

Collectively, these initiatives and policy will make progress toward the goals and vision of the ESS and CEEP, and support social and economic sustainability.

It is recommended that Council approve the proposed requirements for new Part 3 buildings as outlined in this report, and authorize staff to work with the City Solicitor to make the necessary Bylaw amendments as outlined in this report.


Lou Pelletier, Director
PLANNING AND BUILDING

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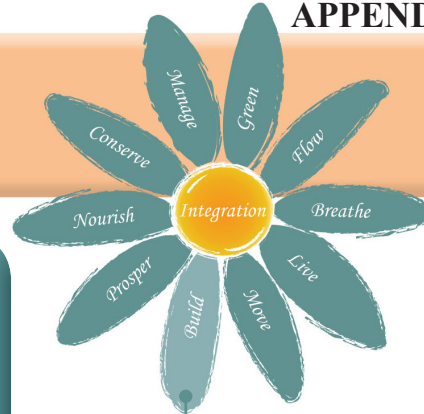
Attachments

cc:	City Manager	Director Finance
	Director Corporate Services	Director Parks, Recreation and Cultural Services
	Director Engineering	Director Public Safety and Community Services
	Chief Building Inspector	City Solicitor
	City Clerk	



Build

Green Buildings and Energy



GOAL:

Buildings and infrastructure that have a positive impact on the environment.



Burnaby
Environmental
Sustainability
Strategy



Community
Energy and
Emissions
Plan

In 2016, Council approved Burnaby's ESS and CEEP, including strategies for green and low-carbon buildings.

READ MORE AT burnaby.ca/ess

Proposed Green Building Policy (2019)

As outlined in this report, Burnaby's green building policy for Part 3 (large) buildings consists of five key components, supported by the Council-approved ESS and CEEP strategies listed:

■ **Energy modeling and air tightness testing** for all new buildings

ESS 6.1, CEEP 3.1

Big Move in Progress: Meet updated energy performance building code requirements for new buildings

■ **Higher energy efficiency** requirements for buildings subject to rezoning

ESS 6.2, CEEP 3.2

New Big Move: Improve building design and construction to meet higher standards of environmental performance

■ **Flexibility** in energy efficiency performance requirements to encourage low carbon energy systems.

ESS 6.6, CEEP C3.6

Encourage a shift to renewable energy for buildings where possible

■ **Low-carbon energy system policy** that supports a variety of efficient, cost-effective and properly maintained systems at the building and neighbourhood scale

ESS 6.5, CEEP C3.5

Investigate district and energy sharing opportunities and encourage their development in appropriate locations

■ **Monitor and report energy use** over time (energy benchmarking) for all new Part 3 buildings

CEEP C3.3

Develop policies and programs to measure and communicate how much energy a building uses, for example... energy benchmarking

Why it matters:

- Nearly half (45%) of the city's community carbon emissions come from heating and cooling buildings.
- Energy efficient buildings cost less to heat and cool and are more comfortable.
- Buildings that use less resources, renewable energy systems and sustainable materials support a healthy environment.
- Buildings can last for many decades, so good design at the outset is important
- Making existing and new buildings more "green" helps to support the economy, creating jobs as well as markets for innovative technology and materials.
- Energy efficient homes support health and affordability, especially for low income households.
- Efficient and low-carbon buildings help us take action on climate change and meet our GHG reduction targets.

Did you know?

Burnaby has many examples of green neighbourhoods and green buildings.

- Burnaby's award-winning UniverCity, a sustainable community home to over 4,000 people, has had green building requirements since 2010, including energy conservation and connection to a district low-carbon energy system.
- Solo in Brentwood Town Centre, among other recent developments, has a low-carbon energy system that uses heat from the ground to heat and cool the buildings.
- City facilities including Edmonds Community Centre, Tommy Douglas Library, and the new South Burnaby Ice Arena (will) have many green features that save energy and water, and reduce operating costs.

GREEN BUILDING POLICY (PART 3 BUILDINGS) - TECHNICAL DETAILS

Overview

The proposed green building requirements are summarized in more technical terms as follows. The requirements for energy efficiency (Steps) reference the amended BC Building Code for Energy Step Code (ESC), Sections 9.36 and 10.2.

Under the City's green building policy, a proponent of a Part 3 building (including residential, or business, personal services or mercantile occupancies) has the following options:

- 1) Develop in accordance with prevailing zoning, and undertake energy modeling and air tightness testing (Step 1 of the Energy Step Code);
- 2) Seek rezoning, under which two options are offered:
 - a. Meet Step 3 of the Energy Step Code; or
 - b. Meet Step 2 of the Energy Step Code, with implementation of a low carbon energy system and a greenhouse gas intensity (GHGI) limit of $6\text{kg/m}^2/\text{y}$.

These initial requirements would likely be adjusted in future to achieve higher levels of energy efficiency and lower carbon emissions, within approximately two to five years. The specific date of future updates would be confirmed later, based on monitoring. It is anticipated that wood-frame buildings may be subject to an earlier update for requiring higher standards, based on industry input and research indicating these building types can more easily accommodate higher energy performance requirements at more modest cost.

More details regarding the components of the policy, including energy modeling, air tightness testing, energy efficiency performance metrics, GHG limits, low-carbon energy systems, and energy benchmarking, are further explained in sections below.

Energy Modeling

All Part 3 buildings would be required to undertake energy modeling and air tightness testing in order to demonstrate compliance with the required Step of ESC. Energy modeling is becoming a common best practice in Part 3 buildings already, and helps to predict the future energy use of various building and energy system design choices.

Requirement: All Part 3 projects will be required to produce an energy model of the building to estimate and confirm that it will meet or exceed minimum energy targets and (if applicable) GHG limits. The ESC references the City of Vancouver's Energy Modeling Guidelines to undertake this modeling. Energy models will be required to be professionally signed and sealed, and submitted to the City in support of an application for all Part 3 buildings.

Air Tightness Testing

Air tightness testing is undertaken when the building is nearing completion and is used to ensure that the building envelope does not have air leaks that would significantly affect energy

performance¹. Specific air leakage rates are not specified in ESC for Part 3 buildings, however, designers must verify that leakage rates assumed in the energy modeling are met or exceeded. This practice is new to BC, but is required in other jurisdictions. Compliance with ESC is demonstrated in the building's design, and through air tightness testing, but not actual energy performance once the building is occupied.

Requirement: Air leakage rates are one of the inputs to energy modeling. Developments will be required to conduct a test of actual air leakage rates near the time of the building's completion, to confirm the building's performance meets or exceeds modeled performance with regard to air tightness. Designers will be encouraged to assume conservative air leakage rates, to hire contractors experienced in ensuring necessary air tightness, and to perform mid-stage diagnostic testing, in order to avoid failing to meet the required Step of ESC due to unexpected air leakage, and delays to address and mitigate air leaks to the satisfaction of the Chief Building Official.

Energy Efficiency Performance Metrics

Energy efficiency of buildings can be improved in many different ways. The Energy Step Code establishes a performance-based approach, which states the required performance metrics, but does not stipulate how a building is to achieve this outcome. This type of approach is generally preferred by designers and builders, as it allows for a variety of creative approaches and designs.

To comply with Burnaby's proposed green building policy, the key metrics are Thermal Energy Demand Intensity (TEDI), Total Energy Use Intensity (TEUI), and, for projects incorporating low carbon energy systems, Greenhouse Gas Intensity (GHGI) as explained in the following section. The specific TEDI and TEUI requirements are outlined in the amended BC Building Code for Energy Step Code (ESC), Sections 9.36 and 10.2.

Summary of ESC Performance Metrics, from BC Housing ESC Design Guide:

<div data-bbox="207 1167 279 1234" data-label="Image"> </div> <p>Thermal Energy Demand Intensity (TEDI)</p> <p><i>Thermal Energy Demand Intensity</i> is a measure of the total heating energy necessary to maintain a comfortable indoor temperature over the course of a year, measured and expressed in kWh/m²/year. The metric considers both passive gains (e.g. incoming solar radiation, heat generated by indoor appliances) and losses (e.g. heat losses through the building envelope), as well as any energy needed to mechanically heat a building or warm incoming ventilation air.</p> <p>To achieve a TEDI target, professionals must maximize gains and minimize losses as much as possible, and reduce reliance on mechanical systems.</p> <p>Strategies for achieving TEDI targets:</p> <ul style="list-style-type: none"> • Minimize heat loss • Consider occupant and unit density • Optimize fenestration • Increase building R-values • Reduce thermal bridging • Increase airtightness • Recover heat during ventilation 	<div data-bbox="889 1167 961 1234" data-label="Image"> </div> <p>Total Energy Use Intensity (TEUI)</p> <p><i>Total Energy Use Intensity</i> is a measure of the total amount of energy a building uses over the course of a year, per unit of building area. The metric considers all energy used in a building, including plug loads (e.g. lighting, appliances) and process loads (e.g. elevators, mechanical systems, fans). Like TEDI, TEUI is measured and expressed in kWh/m²/year.</p> <p>Strategies for achieving TEUI targets:</p> <ul style="list-style-type: none"> • Consider occupant and unit density • Optimize fenestration • Increase airtightness • Recover heat during ventilation • Separate heating and cooling from ventilation
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¹For more background see: Building Science Corporation, BSD-040: Airtightness Testing in Large Buildings. <https://buildingscience.com/documents/digests/bsd-040-airtightness-testing-in-large-buildings>

Greenhouse Gas (GHG) Limits

The BCBC provisions for energy efficiency outlined above (Energy Step Code) do not directly address GHG emissions, as the focus is on reducing overall energy demand, while allowing for any mix of fuel systems for heating and cooling. However, this limitation may result in negligible or modest GHG reduction, depending on the type of fuel used for heating and cooling.

For example, as shown in **Table B1** below, a multi-unit residential building (MURB) constructed to meet Step 2 of ESC may achieve about a 10% reduction in GHG emissions if it uses natural gas for all space heating and domestic hot water, whereas the same building supplied by a low-carbon energy system could achieve a 70% GHG reduction.

Table B1: Estimated potential GHG reduction for a multi-family residential building at ESC Steps 2 and 3 for a building supplied with different energy sources.²

	Expected GHGI emissions intensity (kg/m ² / year)	Percent GHG reduction from baseline
Baseline: typical outcome of current requirements for Part 3 building (BC Building Code)	20	N/A
High rise MURB* using natural gas for heat (common areas and suites) and domestic hot water at Step 2	18	10
High rise MURB* using natural gas for heat (common areas and suites) and domestic hot water at Step 3	15	25
High rise MURB using natural gas for common area heating and domestic hot water and electric heating of suites, at Step 2 or 3	9	55
High rise MURB* using low-carbon district energy for heat (common areas and suites) and domestic hot water at Step 2	6	70
High rise MURB* using low-carbon district energy for heat (common areas and suites) and domestic hot water at Step 3	5	75
High rise MURB* using exclusively electricity for all heat and domestic hot water at Step 2 or 3	<2	>90

*MURB means multi-unit residential building

For these reasons Burnaby's proposed green building policy for Part 3 buildings includes provisions to encourage the use of low carbon energy systems. GHG emissions are typically measured in GHG intensity (GHGI), the total amount of GHGs emitted by a building's energy use over a year, a direct measure of environmental impact that can ensure a specific, measurable and consistent standard.

A GHGI of 6 kg/m²/y would be applied at the outset³ and would apply only to projects seeking the low-carbon option offered through rezoning. As shown in Table B1, implementing a GHGI of 6 (regardless of the Step) would result in 70% GHG reduction. In future, the GHGI could be updated and applied more broadly, to further reduce community carbon emissions. Compliance with the GHGI would be demonstrated through energy modeling, which can be done together

² Sources: (1) Baseline: aggregate value for all building types, based on City of Vancouver Building Bylaw requirements pre-2016; (2) MURB scenarios: ReShape Strategies, Promises and Pitfalls of New Green Building Policies, IDEA Q2 2018.

³ This value was informed by approaches undertaken in other jurisdictions, available studies, and consultation with stakeholders. As shown in Table B5, a GHGI of 6 (regardless of the applicable Step).

with the energy efficiency performance requirements. Further compliance after occupancy is not proposed at this time, but energy benchmarking, explained below, would provide feedback to allow evaluation of GHGI outcomes broadly. Implementation of the GHGI could also support carbon accounting for potential offsetting of the City's corporate emissions, an opportunity currently being investigated.

Low Carbon Energy Systems (LCES) Policy

An LCES can be described as *a professionally operated and maintained, highly efficient mechanical system that supplies a building's space, heating, cooling and domestic hot water heating demand primarily from renewable energy sources, and meets defined GHG limits*. Specific technical criteria for LCES are outlined in a policy that would be provided to applicants.

A variety of types of systems could be chosen, and supportable LCES technologies include, but are not limited to, air and ground source heat pump systems, waste heat recovery systems, biomass systems, and solar collectors, all of which have previously been implemented in Burnaby and neighbouring municipalities. In Burnaby an LCES would typically be owned and operated by:

- A utility at the building or site scale, such as Solo District's geo-exchange system, owned/operated by FortisBC Alternative Energy Services;
- A utility at the neighbourhood scale, such as the SFU Neighbourhood Energy Utility, owned/operated by Corix;
- A user or building owner, provided that specific conditions are met to ensure professional standards of maintenance.

The LCES policy is intended to deliver not only low carbon emissions but also superior energy efficiency, comfort and cost-efficiency for users. Therefore, the proposed policy includes an efficiency standard (*co-efficient of performance*) and a requirement that the LCES be professionally operated and maintained. These provisions would discourage certain types of systems, such as some less efficient natural gas boilers, and electric baseboard resistance heating. Although some of these systems can be cheap to install, they can incur higher operating costs compared to other available systems, particularly at the lower steps of ESC and in consideration of future utility rate increases.

Some types of energy systems also cannot provide cooling in an efficient manner, which is becoming an important priority with climate change effects already being experienced. At this time, the alternative Step 3 rezoning option does not propose to restrict systems choices or fuels, allowing for more flexibility in the policy implementation. As part of ongoing monitoring, staff would evaluate this approach and future consideration may be given to further means to encourage more efficient energy systems more broadly that can deliver benefits including cooling and improved efficiency.

Further technical criteria supporting the LCES policy are available in the Planning and Building Department in a document that would be provided to applicants.

Energy Benchmarking

Energy benchmarking (tracking and reporting energy use) is the process of regularly tracking the energy use in a building and comparing it to the building's own historical energy use, and the energy use of other similar buildings. It is typically used for larger buildings including commercial, industrial, institutional and multi-family residential buildings. At least 20% of commercial floor space in Canada is already being voluntarily benchmarked, and 23 North American cities, three states and the province of Ontario require benchmarking. Most programs use Energy Star Portfolio Manager, which is provided for free online by Natural Resources Canada.

Energy benchmarking is supported by Burnaby's approved CEEP⁴. It is a low-cost and low-effort action that can provide valuable information for monitoring. Benchmarking is not a requirement of Energy Step Code, but would support Burnaby's green building policy for Part 3 buildings, by providing a means for the City to evaluate energy policy effectiveness, providing feedback to support informed decision making by building owners and managers to optimize energy system performance, and reducing energy costs and GHG emissions. Energy benchmarking would be required for all new Part 3 buildings as an administrative requirement of Burnaby's green building policy

To set up energy benchmarking, the building designer (engineer/architect) would input basic information about the building's design and systems, link utility accounts, and designate the City of Burnaby as a "reviewer". To comply with the City's requirement, the developer would submit a short report/memo to the City confirming these actions have been carried out and providing any necessary account information for City access. Supported by BC Hydro and Fortis programs, anonymized energy usage data would automatically be reported. Building owners/managers could access the data and update building system information but would not be required to do anything other than simply allow the annual reporting to occur. City staff would have access to download and analyze this data as needed to inform general reporting and monitoring of policy outcomes. As part of implementation, methods to ensure continued annual reporting may be explored, to ensure the data continues to flow to the City after the project is handed off to a strata.

The energy data reported to the City would not be used for compliance of individual projects with Step Code/GHG policy or bylaws. At this time, the energy benchmarking requirement is proposed to be a City administrative requirement applicable to new Part 3 buildings, for City review but not public disclosure.

⁴ CEEP Build Strategy C3.3: *Develop policies and programs to measure and communicate how much energy a building uses, for example using energy audits and EnerGuide labels and/or **building benchmarking**.*