

The objective of the LCES policy is to define requirements for low carbon energy systems in compliance with Burnaby's green building policy for Part 3 buildings*, so that these systems deliver the intended GHG reduction and efficiency benefits over the life of the development, support innovation and use energy responsibly. *See also www.burnaby.ca/greenbuildings

Background

Under the City's green building policy, a proponent of a Part 3 building has the following options:

- 1) Develop in accordance with prevailing zoning, and meet at least 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 **LCES and defined greenhouse gas intensity (GHGI) limits**.

This document outlines criteria for meeting Option 2(b).

What is a low-carbon energy system?

A low carbon energy system means a highly efficient, professionally operated and maintained mechanical system that supplies a building's space, heating, cooling and domestic hot water heating demand primarily from renewable energy sources, at a carbon intensity that is low enough so that when applied to modelled building energy use, the development satisfies the City's defined GHG limits as outlined in the green building policy.

What is greenhouse gas intensity (GHGI) and how it is determined?

GHGI is a measure of the total amount of GHG associated with a building's energy use. It is a calculated value determined through energy modeling: energy (kWh) supplied to a building, multiplied by the emissions factor of the energy¹ (a measure of how much GHG emissions are associated with its use) and summed for each type of energy used (e.g. electricity, natural gas, hot water); the resulting value is divided by the building's floor area. GHGI is reported in kg of carbon dioxide equivalent (CO₂e) per m² of floor area per year (kg CO₂e/m²/y).

The equation is shown below:

$$GHGI \left[\frac{kgCO_2e}{m^2a} \right] = \frac{\sum \left(Site \ Energy \ Use \left[\frac{kWh}{a} \right] \times Emissions \ Factor \left[\frac{kgCO_2e}{kWh} \right] \right)}{Modelled \ Floor \ Area \ [m^2]}$$

A GHGI of 6kg/m²/y is currently required under option 2(b) above in Burnaby's Green Building Policy for Part 3 buildings.

¹ Refer to the City of Vancouver Energy Modelling Guidelines, which are also referenced for Energy Step Code methodology, for emissions factors. <https://vancouver.ca/files/cov/energy-modelling-guidelines-v1.0.pdf>

Considerations of Choosing the LCES pathway

Some types of LCES require feasibility study, review and approval by the BC Utilities Commission (BCUC), and/or agreements with a utility, and sufficient time needs to be allowed for such processes and approvals. Any LCES and associated utility must comply with all requirements of the *Utilities Commission Act*, if applicable.

What types of low-carbon technologies would be supported under the LCES Policy?

Supportable low-carbon technologies include, but are not limited to, air and ground source heat pump systems, waste heat recovery systems, solar collectors, or other systems as approved by the City's Director of Engineering. Common types of LCES and their requirements are listed below.

1. Utility-Owned LCES

This type of LCES refers to a system that is owned and operated by a utility, which may fall into one of two sub-categories as outlined below.

(a) Utility-owned On-Site LCES

This type of LCES is owned by a utility and services one or more buildings on a single development. This type of system must meet the following requirements:

- i) A qualified engineer must provide written verification that the LCES is designed to provide low carbon energy that meets the City's GHGI limits.
- ii) There must be evidence that a utility will purchase the LCES and supply energy service from the LCES to the development for at least 10 years.
- iii) The utility must have demonstrated experience with other similar successful LCES.
- iv) The developer must deliver evidence to the City's satisfaction that the LCES was successfully registered with the BCUC, and that the ownership of the LCES was, or will soon be, duly transferred to a utility.
- v) Information about the LCES must be disclosed to future owners.

Current Example: Solo District, multi-unit residential and mixed-use buildings in Brentwood Town Centre, with geo-exchange system owned/operated by FortisBC Alternative Energy Services.

(b) Utility-Owned District LCES

This type of LCES is owned by a utility and services multiple sites at a neighbourhood scale. This type of system must meet the following requirements:

- i) There must be a feasibility study completed to the satisfaction of the City that confirms the LCES will provide low carbon energy such that the development(s) proposing to connect to the system will meet the City's GHGI limits.
- ii) The BCUC must have issued a Certificate of Public Convenience and Necessity in accordance with the *Utilities Commission Act*, approving the district-scale LCES.

- iii) There must be evidence of an agreement between the utility partner and building owner to supply low-carbon energy for at least a 10 year period to the proposed development.
- iv) There must be an agreement between the utility and the City for annual utility reporting on the energy used and provided by the district-scale LCES to each building, in accordance with the proposed Energy Benchmarking requirements.
- v) Information about the LCES must be disclosed to future owners.

Current Example: SFU Neighbourhood Energy Utility (transitioning to low-carbon biomass), owned by Corix.

2. User-Owned On-Site LCES

This type of system is owned by, located within and serves a particular development. In order to ensure that this type of system is appropriately designed, optimized and maintained, and achieves a level of efficiency to meet the intent of the LCES policy, it must meet the following requirements:

- i) A qualified engineer must provide written verification that the LCES is designed to meet the following requirements:

- a. The system seasonal average co-efficient of performance must be greater than 2.

The intent of this provision is to ensure that only highly efficient systems are implemented, to manage energy wisely and cost-effectively. Electric baseboard resistance heating systems or lower-efficiency natural gas boiler systems would not meet this provision.

- b. A GHGI value 33% below the required GHGI limit must be used.

The intent of this provision is to account for lower operational performance than designed, as the system will not be overseen as closely as a BCUC-regulated system.

- ii) There must be a minimum 2-year maintenance, warranty, and optimization contract with the system provider.

The intent of this provision is to ensure that the system is functioning as designed in the critical early stages of operation.

- iii) There must be a minimum 5-year owner-funded maintenance contract with a qualified provider.

The intent of this provision is to ensure that the system is properly maintained.

- iv) In the case of a building owned by a residential strata corporation, prior to the application for an occupancy permit, the developer must deliver evidence to the City's satisfaction that the funding structure for long-term maintenance has been

established. This may include an initial strata budget and strata fee structure that provides for maintenance and capital replacement of the LCES.

The intent of this provision is to ensure transparency for strata members and an economically viable plan to ensure appropriate long-term management of the system.

Current Example: There are currently no user-owned on-site LCES in Burnaby. An example from Vancouver is a lease-to-own system of air source heat pumps in operation in the MC2 residential building in the Cambie/Marine Drive area.

Reporting

In accordance with the Energy Benchmarking administrative requirements of Burnaby's green building policy, all new Part 3 buildings must report energy use to the City on an annual basis. Therefore, there must be an Energy Reporting Agreement established between the City and the owner of the LCES for annual reporting of energy used both by the building and the LCES (if the LCES supplies more than one building), completed by a qualified professional. The energy used by a building supplied by an LCES must therefore be metered, and the annual energy use by type, energy cost, and carbon intensity must be reported.

Aggregation

If a developer of a particular site is able to design an LCES that out-performs the City's GHG requirements, the exceeded performance may, in concept, be applied to another site developed by the same applicant, if the City is satisfied that that reliable and permanent GHG reductions can be achieved in accordance with the approved green building policy. The City would entertain a proposal to this effect from an applicant and specific conditions and requirements as deemed necessary would be established.

The intent of this provision is to allow and encourage innovation and systems approaches while acknowledging site constraints, similar in outcome to if a larger district energy system was in place.

Renewable Natural Gas (RNG)

In concept, the City supports the use of renewable natural gas, such as currently supplied by FortisBC, and/or if one day the City develops a facility to capture RNG from locally collected organic waste. In terms of the use of RNG in LCES, there are currently some uncertainties, in particular the supply and whether long-term agreements to supply a building with RNG could be established. The City is open to considering approaches that could encourage the use of RNG in future if these concerns can be addressed to the satisfaction of the City. Specific provisions may be added to this LCES Policy in future for further clarification as needed.

Appendix A: Low Carbon Energy System (LCES) Policy

Administrative Requirements

2019 March 20

This appendix provides a summary of documentation and verification requirements at various steps of development approval, to demonstrate compliance with the Low Carbon Energy System (LCES) Policy, approved as part of Burnaby's Green Building Policy. Additional submission requirements to meet the City's Green Building Policy, for all applicable Part 3 projects subject to rezoning, are included in the *Part 3 Green Building Submission Requirements* bulletin.

As outlined in Burnaby's LCES Policy, one of three types of LCES may be implemented:

1. **Utility-Owned LCES**, including the following two sub-categories:
 - a. **Utility-Owned On-Site LCES**: This type of LCES is owned by a utility and services one or more buildings on a single development. A utility of this type is typically regulated by the BCUC as a Stream A Thermal Energy System.
 - b. **Utility-Owned District LCES**, which is owned by a utility and services multiple sites at a neighbourhood scale.
2. **User-owned On-Site LCES**, which is owned by, located within and serves a particular development.

For each of the requirements listed in the LCES Policy, the documentation listed in **Tables A1 to A3** must be submitted. In addition, please refer to requirements outlined in the document titled **Part 3 Green Building Submission Requirements**, available at www.burnaby.ca/greenbuildings (under Resources).

Table A1. Type 1(a) – Utility-Owned On-Site LCES

LCES Policy Requirement	Submission Requirement	Approval or Permit Stage
i) A qualified engineer must provide written verification that the LCES is designed to provide low carbon energy that meets the City’s GHGI limits.	Signed and sealed report with preliminary LCES design summary, aligned with current drawings on file and the energy checklist, confirming site GHG limits achieved.	Preliminary design (“gel set”)
	If the design has changed, an updated report, confirming system still meets require energy and GHG performance.	Public hearing set (“suitable plan of devel”)
	Signed and sealed report with a final LCES design summary, aligned with professional drawings and energy checklist, confirming site GHG limits achieved.	Building Permit
ii) There must be evidence that a utility will purchase the LCES and supply energy service from the LCES to the development for at least 10 years.	Letter from proposed utility partner, confirming their interest in purchasing the LCES.	Preliminary design (“gel set”)
	Documentation of agreement between utility and owner for purchase and long-term operation of the utility.	Building Permit
	Documentation of purchase by utility and registration with BCUC of utility (or micro TES exemption).	Occupancy Permit
iii) The utility must have demonstrated experience with other similar successful LCES.	If requested by City, letter with attached documentation as required to demonstrate relevant past experience with on-site and/or district thermal energy systems, and system operating history (energy costs, BCUC interactions, etc.).	Preliminary design (“gel set”)
iv) The developer must deliver evidence to the City’s satisfaction that the LCES was successfully registered with the BCUC, and that the ownership of the LCES was, or will soon be, duly transferred to a utility.	Documentation of purchase by utility and registration with BCUC of utility (or micro TES exemption).	Occupancy Permit
v) Information about the LCES must be disclosed to future owners.	Documentation of disclosure of relevant LCES information to future owners.	Building Permit
Annual reporting of energy use (at building scale by major end-use), costs and GHG intensity must be provided to the City.	Letter of agreement by utility to provide City with annual reporting data.	Occupancy Permit
	Annual reporting* of building energy use, cost, and emissions data by fuel type and LCES-related end use.	Post-occupancy

Table A2. Type 1(b) – Utility-Owned District LCES

LCES Policy Requirement	Submission Requirement	Approval or Permit Stage
i) There must be a feasibility study completed to the satisfaction of the City that confirms the LCES will provide low carbon energy such that the development(s) proposing to connect to the system will meet the City’s GHGI limits.	Signed and sealed report with preliminary LCES design summary, aligned with current drawings on file and the energy checklist, confirming site GHG limits achieved.	Preliminary design (“gel set”)
	Signed and sealed complete LCES feasibility study from the proposed utility partner and aligned with current drawings on file and the energy checklist, confirming development achieves site GHG limits	Public hearing set (“suitable plan of devel”)
ii) The BCUC must have issued a Certificate of Public Convenience and Necessity in accordance with the Utilities Commission Act, approving the district-scale LCES.	BCUC issued CPCN for LCES, in accordance with City-approved feasibility study.	Building Permit
iii) There must be evidence of an agreement between the utility partner and building owner to supply low-carbon energy for at least a 10 year period to the proposed development.	Letter from the owner, confirming their intent to connect the development to the proposed utility partner.	Preliminary design (“gel set”)
	Documentation of agreement between utility and owner for long-term energy supply to the development from the LCES.	Building Permit
	Documentation of connection of the development to the utility.	Occupancy Permit
iv) There must be an agreement between the utility and the City for annual utility reporting on the energy used and provided by the district-scale LCES to each building, in accordance with the proposed Energy Benchmarking requirements.	Letter of agreement by utility, and registration of covenant, to provide City with annual reporting data (benchmarking).	Occupancy Permit
	Annual reporting* of building energy use, cost, and emissions data by fuel type and LCES-related end use.	Post-Occupancy
v) Information about the LCES must be disclosed to future owners.	Documentation of disclosure of relevant LCES information to future owners.	Building Permit

Table A3. Type 2 – User-Owned On-Site LCES

LCES Policy Requirement	Submission Requirement	Approval or Permit Stage
<p>i) A qualified engineer must provide written verification that the LCES is designed to meet the following requirements:</p> <p>a. The system seasonal average co-efficient of performance* must be greater than 2.</p> <p>b. A GHGI value 33% below the required GHGI limit must be used.</p>	<p>Signed and sealed report with preliminary LCES design summary, aligned with professional drawings and the energy checklist, confirming the site achieves: Reduced site GHG limits; a system COP>2; peak sizing limits.</p>	<p>Preliminary design (“gel set”)</p>
	<p>If the design has changed, an updated report, confirming system still meets require energy and GHG performance.</p>	<p>Public hearing set (“suitable plan of devel”)</p>
	<p>Signed and sealed report with a final LCES design summary, aligned with current drawings on file and energy checklist, confirming: reduced site GHG limits; COP>2; peak sizing limits.</p>	<p>Building Permit</p>
<p>ii) There must be a minimum 2-year maintenance, warranty, and optimization contract* with the system provider.</p> <p>iii) There must be a minimum 5-year owner-funded maintenance contract* with a qualified provider.</p> <p>iv) In the case of a building owned by a residential strata corporation, the funding structure for long-term maintenance* must be established, which may include an initial strata budget and strata fee structure that provides for maintenance and capital replacement of the LCES.</p>	<p>Documentation detailing the proposed 2y min. warranty and optimization and 5y min. maintenance contracts, and strata funding structure, will be established.</p>	<p>Building Permit</p>
	<p>Report summarizing optimization and maintenance contract activities and outcomes, including documentation owner funding structure has been established.</p>	<p>Occupancy Permit</p>
<p>Annual Reporting</p>	<p>Letter of agreement from system provider, and registration of covenant, to submit annual reporting to City (benchmarking).</p>	<p>Occupancy Permit</p>
	<p>Annual reporting* of building energy use, cost, and emissions data by fuel type and LCES-related end use.</p>	<p>Post-Occupancy</p>

***Further Explanation of Terms in Table A3**

Coefficient Of Performance (COP): the efficiency of the heating plant, to be calculated as the annual sum of all heating output delivered to the spaces of the building (kWh), divided by the annual fuel input to all of that same equipment, as estimated in the energy model used for compliance, or measured after occupancy.

2-year minimum maintenance, warranty, and optimization contract: This refers to an enhanced and extended version of a traditional 1-year warranty and replacement contracts that accompany the building systems in new construction. The Maintenance portion may or may not be a part of this contract scope, and may be part of the separate 5-year minimum maintenance contract. The warranty and optimization scope must be for a minimum of 2 years following occupancy of the building, and may be longer. The intent of this scope is to achieve a building that is fully commissioned and optimized for operation in all seasons and use conditions and for full occupancy, conducted by experts in the setup and optimization of high-performance mechanical systems in buildings of this type. The intent is also to stabilize operation of the building, troubleshoot and solve any subtle operational issues that may not be detectable during normal commissioning duties, and simplify, standardize, and support the ongoing successful and efficient operation of the building by the owner or their designated building operations and maintenance staff. The completion of this contract must include a full report in plain English provided to the owner, including the optimization activities conducted, problems found and improvements made, best practices to be continued by the owner, and recommendations for any further actions the owner should take to ensure the successful continued operation and long-term maintenance of the on-site LCES.

5-year minimum maintenance contract: This refers to a long-term, comprehensive planned and preventative maintenance contract covering the LCES and related building energy, HVAC and plumbing systems, established to cover a period of no less than 5 years after occupancy of the building. Services in this type of contract typically include regular activities such as (but not limited to): cleaning of filters and drains, leak prevention and repair, checking and balancing of rotating equipment, disassembly and cleaning of key equipment or parts, review of controls setpoints and key performance indicators, chemical maintenance and corrosion prevention, energy management and monitoring, alarm maintenance and response, carbon monoxide and/or other gas detection monitoring, sewer and sump maintenance, regular and planned replacement of components (motors, compressors, valves, etc.), budgeting assistance to owners for major component and equipment capital replacements, and communication with owners and users. These contracts may or may not also include suite-level energy and/or water sub-metering and billing to users. This contract must be established in such a way that would be easy for the building owner to continue in perpetuity.

Strata funding structure: for buildings to be owned and operated by a strata corporation, the Policy requires the strata budget and associated fees to be established to allow for the full estimated cost of all maintenance activities related to the LCES, including the 5-year minimum maintenance contract noted above. This also includes provisions for regular savings to prepare for planned capital replacements of components or equipment as may be required. Capital replacements could include replacement of key components such as compressors, and whole

equipment, including at the end of the estimated life of the primary LCES equipment such as one or more heat pumps. This funding structure must be included in any disclosure to potential future owners as may be required by regulation. The intent of ensuring this funding structure is established is to ensure the strata is setup to successfully fund long-term maintenance and capital replacement requirements associated with the LCES from the beginning and as a normal course of operations, without any additional initiative required from the strata members to ensure successful operation of the LCES for the life of the building.

Annual Reporting

The City's LCES Policy states:

“In accordance with the Energy Benchmarking administrative requirements of Burnaby's green building policy, all new Part 3 buildings must report energy use to the City on an annual basis. Therefore, there must be an Energy Reporting Agreement established between the City and the owner of the LCES for annual reporting of energy used both by the building and the LCES (if the LCES supplies more than one building), completed by a qualified professional. The energy used by a building supplied by an LCES must therefore be metered, and the annual energy use by type, energy cost, and carbon intensity must be reported.”

In addition to whole-building energy use reporting by source type, as noted above, LCES projects must report annually to the City the following, at a minimum, for each building on the site (as applicable):

- Monthly energy use by source type;
- Monthly energy use by end-use:
 - heating,
 - cooling,
 - DHW,
 - other end-uses as available;
- Monthly on-site renewable energy generation;
- Monthly off-site renewable energy procurement;
- Monthly energy exports from site;
- Monthly peak demand by source type;
- Monthly total carbon intensity of heat delivered;
- Annual key performance metrics, including total energy cost, heating carbon intensity, heating and cooling COPs

The above should be reported in a clear and concise manner such as brief report, together with tables and charts and any explanatory notes that may be necessary to understand and assess the information reported.