



PERFORMANCE MONITORING AND REPORTING REQUIREMENTS FOR LOW CARBON ENERGY SYSTEMS

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1 Introduction and Intent

This document summarizes the minimum performance monitoring and performance reporting requirements for low carbon energy systems under construction for new development projects where low carbon energy systems are required.

The collection and synthesis of performance monitoring data is of benefit to both the system owner/operator and the City of Vancouver. The rationale for requiring performance monitoring and reporting of low carbon energy systems is to:

- (a) Assess short- and long-term system performance and provide opportunities for optimization of system operation for the purpose of improving on-going system performance and efficiency.
- (b) Confirm actual building energy demands for domestic hot water heating, and space and ventilation air heating and cooling, and to improve understanding of the performance, reliability, and long-term sustainability of low carbon sourced systems to inform the appropriate design of future systems within our community.

2 Definitions

- (a) “**Performance Monitoring**” means the collection, synthesis, and interpretation of low carbon energy system performance metrics including energy inputs, energy demands, coefficients of performance, and trends in long-term system performance. Specific performance monitoring requirements are outlined in Section 3 below.
- (b) “**Low Carbon Energy System**” means a thermal energy generating, distribution, and delivery system that incorporates low carbon energy sources (such as sewage heat recovery, geoexchange, surface water exchange, heat recovery, air source heat pumps, solar thermal, biomass, etc.) for space and domestic hot water heating, and in some cases cooling, for the development, and that may include conventional heating and cooling sources (such as boilers, chillers, cooling towers, etc.) to satisfy peaking and backup thermal energy requirements as agreed to by the General Manager of Engineering Services.

- (c) “**Low Carbon Energy System Equipment**” means all the mechanical and electrical equipment used to produce and distribute water for heating, cooling and domestic hot water as part of the Low Carbon Energy System. This equipment will likely consist of heat pumps, chillers, boilers, cooling towers, distribution or circulation pumps, heat exchangers, air handling units, commercial/industrial process equipment, etc. Typically most of this equipment would be located in a common HVAC mechanical room.

3 Minimum Instrumentation Requirements

The energy system must be designed in such a way as to enable energy monitoring for the purpose of determining overall system performance. Typically this will require monitoring of all the inputs and outputs to the Low Carbon Energy System Equipment, including, but not limited to, provisions for the following:

- (a) Gas-fired systems shall include inlet and outlet temperature sensors and a flow meter (or BTU meter) on the building loop, and totalizing gas meters to measure fuel usage.
- (b) Chiller or heat pump system monitoring controls shall include inlet and outlet temperature sensors and a flow meter (or BTU meter) on both the source side and load side for the purpose of monitoring system performance and building energy demand.
- (c) Electrical meters for monitoring electrical requirements of all Low Carbon Energy System Equipment, including heat pumps, pumps, motorized valves, etc.
- (d) Sensors and flow meters should be capable of logging data on an hourly basis for use in performance monitoring and reporting.
- (e) Domestic Hot Water systems shall include flow meters for the purpose of estimating hot water energy demand.

Alternative means of system monitoring may be agreed to by the General Manager of Engineering Services.

4 Minimum Information Requirements

Low Carbon Energy System monitoring must enable collection and calculation of the following:

- (a) Total monthly electricity consumption of Low Carbon Energy System Equipment;
- (b) Total monthly natural gas consumption of Low Carbon Energy System Equipment;
- (c) Total monthly energy recovered from commercial/industrial process equipment;
- (d) Boiler efficiencies;
- (e) Coefficients of performance of heat pumps in cooling and heating mode;
- (f) Total monthly and peak monthly heating demand;
- (g) Total monthly and peak monthly cooling demand;
- (h) Total monthly and peak monthly domestic hot water demand;
- (i) Heat pump source side entering fluid temperatures and seasonal changes in the entering fluid temperatures from the geexchange field (if applicable); and
- (j) Percentage of heating and cooling energy demands being met by low carbon sourced energy.

5 Reporting Requirements

5.1 Performance Monitoring and Reporting Plan

A proposed performance monitoring and reporting plan for the Low Carbon Energy System shall be submitted at the time of building permit application which describes how system performance data will be collected and analyzed for the purpose of evaluating short- and long-term system performance, system efficiency, energy consumption, building energy demand, and opportunities for optimization of system operation and efficiency.

5.2 Reporting Schedule

A Performance Monitoring Report of the Low Carbon Energy System, certified by a Registered Professional Engineer, shall be submitted one (1) and three (3) years following system startup. The performance monitoring report must conform to the scope and requirements agreed to by the General Manager of Engineering Services at the time of building permit issuance.

Interim performing monitoring data for one month of system operation shall be completed and submitted within 2 months of system startup. Specifically, one month of data under the sections labeled “Sources of Energy” and “Thermal Outputs” in **Appendix A** shall be submitted.

5.3 Reporting Format

Performance monitoring reports must provide a collated summary of system performance trends, energy inputs and building energy demands based on monthly data collected over the monitoring period (e.g. 1 and 3 year timeframes). It is the responsibility of the energy system operator, or delegate, to compile and interpret the data and present the information in a manner that clearly summarizes trends in short- and long-term system performance and recommends opportunities for system operation optimization to improve system efficiency and sustainability, where warranted.

The format of the report must be agreed to by the City in advance of building permit issuance. Reports shall include at minimum the monitoring data and reporting metrics included in **Appendix A**, attached.

6 Responsibility

Performance monitoring and reporting is the responsibility of the Developer, Commercial Land Owner, and/or Utility Provider and shall not be passed on to Building Strata Owners.

In support of the requirements summarized in this document, the City may require delivery of the following items, to the Satisfaction of the General Manager of Engineering Services and the Director of Legal Services, at suitable development milestones:

- (a) Proposed detailed design for the Low carbon Energy System;
- (b) Delivery and approval of a Performance Monitoring and Reporting Plan;
- (c) Legal agreements for delivery of Performance Monitoring Reports;
- (d) Confirmation that the Low Carbon Energy System meets the required detailed design provisions;
- (e) Copies of mechanical commissioning and testing reports for the Low Carbon Energy System; and
- (f) Delivery of Performance Monitoring Reports.