



# Terms of Reference: Energy Study



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## Study Description

An Energy Study explores how different approaches to energy efficiency can impact a proposed new development. The purpose of this exploration is to identify strategic energy options early in the development process, promote communication between applicants and sustainable building designers, and inform subsequent design decisions, with the goal of reducing energy consumption and greenhouse gas emissions with minimal project disruption and cost.

The City has committed to reduce community-based greenhouse gas emissions by 50% by 2030 and 80% by 2050 relative to 2010 levels ([TransformWR](#)). Energy Studies are required in response to these targets and to promote environmental, economic, and social sustainability. Undertaking an Energy Study at the beginning stages of select Zoning By-law Amendments and Draft Plans of Subdivision is intended to facilitate the following:

- Identification of opportunities to increase energy efficiency and reduce greenhouse gas emissions in new development at the conceptual design stage.
- Consideration of opportunities to site buildings and configure blocks to take advantage of existing or proposed energy infrastructure, energy capture, and/or solar orientation.
- Consideration of opportunities to optimize the installation of future building energy systems that will allow the development to cost-effectively achieve net-zero energy performance.
- Consideration of opportunities to increase resiliency.
- Consideration of embodied carbon and material selection.
- Exploration of potential operational cost savings and capital cost incentives.

## Purpose

The purpose of this Terms of Reference (“TOR”) is to establish clear expectations and requirements for the preparation of Energy Studies submitted to the City of Waterloo. Compliance with these guidelines will help to expedite review times and mitigate the need for further revisions and submissions. Failure to satisfy the requirements set out in this TOR may result in an application being deemed incomplete. If

an application is deemed incomplete it will be returned to the applicant to satisfy the necessary submission requirements.

## Definitions

**Total Energy Use Intensity (TEUI)** – The energy consumed by a building each year normalized by the conditioned floor area. TEUI is to be reported in kWh/m<sup>2</sup>.

**Thermal Energy Demand Intensity (TEDI)** – The annual heating energy required for a building to maintain a stable, pre-defined interior temperature, normalized by the conditioned floor area. TEDI is to be reported in kWh/m<sup>2</sup>.

**Greenhouse Gas Emissions Intensity (GHGI)** – The annual greenhouse gas emissions of a building based on fuel-specific emission factors normalized by the conditioned floor area. GHGI is to be reported in kg eCO<sub>2</sub>/m<sup>2</sup>.

**Representative Home** – A home that is characteristic of the most common unit type in the proposed subdivision.

## When is it Required?

An Energy Study may be required for the following Planning Act applications:

- Zoning By-law Amendment proposing at least one building that is 7 storeys or more in height
- Draft Plan of Subdivision proposing predominately low rise residential development
- Other planning applications, as determined by the City.

Exclusions:

- Zoning By-law Amendments that are deemed to be minor by the City.
- Zoning By-law Amendments that are limited to removing a Holding Symbol
- Other exclusions at the discretion of the City.

Excluded applications will still be encouraged to complete an Energy Study.

The need for an Energy Study as part of a complete application will be identified as part of the pre-application consultation review. In the instance where a planning application being advanced does not have a mandatory pre-application consultation process (e.g., Committee of Adjustment applications) the applicant is encouraged to contact the City's Planning Division to discuss the nature of the proposal and to determine if an Energy Study is required.

## Qualified Persons

An Energy Study shall be prepared by a qualified and competent professional in good standing with adequate experience in energy modelling, sustainable design, and building performance. At least one report author must be a licensed Professional Engineer. The report must identify and be signed by the author(s) and, where prepared under the direction of a qualified professional, the signature of the reviewer of the report. The qualified professional that has signed the report shall take professional responsibility for its contents and the accuracy of the information contained therein.

## Applicable Legislation

The authority to require or request information or material to evaluate and make a decision on proposed planning applications is provided by the Ontario *Planning Act*, the Provincial Policy Statement, and City of Waterloo Official Plan Section 12.2.14 (“Complete Applications”).

This Terms of Reference document is to be applied in conjunction with all applicable regulations, by-laws, and guidelines, including the City of Waterloo’s Urban Design Manual and Comprehensive Engineering and Landscape Manual.

## Report Contents

This TOR document sets out the minimum requirements that must be included in all reports. More specific scoping of the Energy Study may be identified by appropriate staff during the pre-application consultation process. Each requirement identified below should be included as its own section in the report. In completing the various requirements, the use of representative archetype models is permitted so long as the building use types, building sizes, climatic data, code requirements, and proposed design packages are represented.

### Zoning By-law Amendment

#### A. Overview of Proposed Development

Briefly describe the proposed development, including site layout, building size, and use.

#### B. Energy and Emissions Analysis

Model various energy conservation measures to demonstrate a potential path to achieve the following three scenarios:

- i.) Building Code Baseline
- ii.) High Performance where Total Energy Use Intensity (TEUI) is reduced by 30%, Thermal Energy Demand Intensity (TEDI) is reduced by 30%, and Greenhouse Gas Emissions Intensity (GHGI) is reduced by 50%, all relative to the current Building Code
- iii.) Net-Zero Ready Performance where Total Energy Use Intensity (TEUI) is reduced by 60%, Thermal Energy Demand Intensity (TEDI) is reduced by 60%, and Greenhouse Gas Emissions Intensity (GHGI) is reduced by 90%, all relative to the current Building Code

Provide a summary of the assumptions made, including those related to the effective building envelope performance, HVAC system type/efficiency, ventilation rates, and window-to-wall ratio.

### **C. Envelope Analysis**

Based on building type, identify one sample envelope detail for scenarios ii.) and iii.) above that allows for the effective performance values used in the energy and emissions analysis to be achieved. A qualitative discussion of thermal bridging based on the [Building Envelope Thermal Bridging Guide](#) analysis method, including impacts of balconies, linear losses around windows, corners, parapets, etc. must be included. The sample detail only needs to be representative of an applicable envelope, and be the basis for a narrative that discusses the challenges expected with the given building type.

### **D. Renewables and Embodied Carbon**

Identify opportunities for on-site renewables and reduced embodied carbon. For embodied carbon, identify the expected highest embodied carbon material in the anticipated design and identify at least one method of reducing the emissions associated with that material.

### **E. Resiliency**

Identify design considerations to increase resiliency, such as increased thermal resistance, adaptable building systems, and back-up power systems that could provide 72 hours of support for hot and cold water, elevator service, space heating, lighting, and receptacle power.

## **F. Discussion and Recommendations**

Discuss the results of the energy and emissions analysis, including potential impact on utility use, utility cost (accounting for carbon pricing), and greenhouse gas emissions, and provide recommendations on how the proposed development can reduce its energy consumption and greenhouse gas emissions, incorporate on-site renewables, reduce embodied carbon, and increase resiliency.

### **Draft Plan of Subdivision**

#### **A. Overview of Proposed Development**

Briefly describe the proposed development, including land area, unit type, and unit count.

#### **B. Energy and Emissions Analysis**

Model the estimated energy and emissions performance of a Representative Home under the following three scenarios:

- i.) Building Code Baseline
- ii.) ENERGY STAR® for New Homes or R-2000
- iii.) Canadian Home Builders' Association Net Zero Home Labelling Program or Passive House Standards

Quantify the Total Energy Use Intensity (TEUI), Thermal Energy Demand Intensity (TEDI), and Greenhouse Gas Emissions Intensity (GHGI) for each scenario. Provide a summary of the assumptions made, including those related to the effective building envelope performance, HVAC system type/efficiency, ventilation rates, and window-to-wall ratio.

#### **C. Envelope Analysis**

Based on building type, identify one sample envelope detail for scenarios ii.) and iii.) above that allows for the effective performance values used in the energy and emissions analysis to be achieved. A discussion of thermal bridging based on the [Building Envelope Thermal Bridging Guide](#) analysis method, including, as applicable, impacts of balconies, linear losses around windows, corners, parapets, etc. must be included. The sample detail only needs to be representative of an applicable envelope, and be the basis for a narrative that discusses the challenges expected with the given building type.

#### **D. Discussion and Recommendations**

Discuss the results of the energy and emissions analysis, including potential impact on utility use, utility cost (accounting for carbon pricing), and greenhouse gas emissions, and provide recommendations for how the proposed development can reduce its energy consumption and greenhouse gas emissions.

#### **Additional Information**

*Note 1:*

If City staff consider the submitted Energy Study to be incomplete, unsatisfactory, inconsistent, insufficient, authored by an unqualified individual, or if it fails to satisfy the requirements set out in this TOR in any other manner, the associated development application may be deemed incomplete and returned to the applicant.

*Note 2:*

Deeming an application complete does not guarantee that the contents of the study are acceptable to City staff and/or that the application will be approved.

*Note 3:*

If a request for an Energy Study is not made at an earlier stage in the development process, this does not preclude the City from requesting an Energy Study at a later stage. Once an application has been deemed “complete”, the City may require additional information, reports, and/or studies following a more detailed review to assess the implications of an application for approval.

*Note 4:*

The City of Waterloo is committed to complying with the Accessibility for Ontarians with Disabilities Act (AODA). In our everyday work with businesses institutions, and community partners we anticipate the same commitment to AODA compliance. Therefore, the Energy Study must be AODA compliant and must meet the current provincial standard for compliance.

*Note 5:*

The City reserves the right to request an updated study, or an addendum thereto, should staff determine that changes in the development proposal or changes to legislation warrant further/modified planning analysis.

*Note 6:*

City staff reserve the right to require a peer review of submitted materials by an appropriate agency or qualified professional, the cost of which will be borne by the applicant.

*Note 7:*

Documents and all related information submitted to the City as part of a complete development application are considered public documents once submitted.

*Note 8:*

The Energy Study shall be submitted in conjunction with the applicable development application(s), unless otherwise agreed to by the City.

*Note 9:*

This TOR document is intended to be used for guideline purposes only, and will be used to provide technical direction throughout the planning and development process. Completion of a report in alignment with the requirements of this Terms of Reference will not guarantee approval of the development application in question.

*Note 10:*

This TOR is relevant at the time of publishing and will be updated as necessary to reflect current policy, best practices, and accepted standards. It is the applicant's responsibility to ensure the report is prepared in accordance with the most recent version of the TOR issued by the City.

*Note 11:*

An Energy Study is intended to apply an energy and carbon lens to a proposed development. It is the responsibility of a design engineer to determine compliance with the Building Code.

*This Terms of Reference was peer-reviewed by a qualified external consulting firm. For clarification for any information contained within this document, please contact the City of Waterloo staff assigned to the pre-consultation process.*