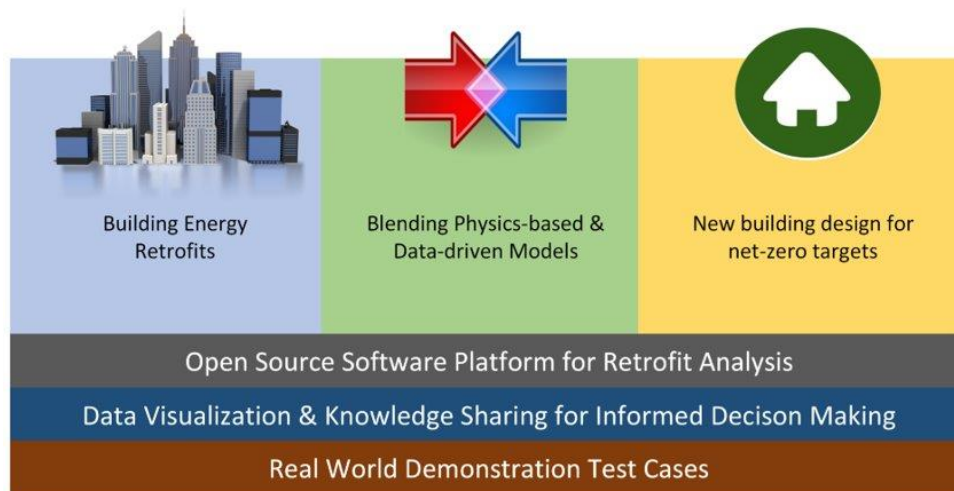


Identification of building retrofit bundles to inform key retrofit initiatives

A partnership between the Rebuild Initiative and the City of Victoria



Position available at Masters, PhD or Post-doctoral level

Urban planners, policymakers and municipalities face significant challenges when identifying building energy efficiency opportunities and developing strategies to achieve efficient and sustainable urban environments. Urban Building Energy Modeling (UBEM) are often used to quantify residential buildings and develop the building stock database at a national level. UBEMs make use of physical properties of individual buildings and employ building energy simulation tools to model and simulate the use of a single building archetype, thus, representing the actual building stock. In the event of data being limited or almost non-existent, data-driven urban energy modeling could be used to quantify the urban building stock and predict the energy rating. UBEMs provide automated generation of building energy models through abstraction of building stock by different ‘building archetypes’, i.e., sample or virtual buildings that characterize subsets of buildings of the same kind.

This project will assess the stock-level impacts of different retrofit actions, to guide municipalities on the actions needed to meet climate emergency obligations, focusing on **Multi-residential, Commercial and Institutional** buildings. This will use an archetype derivation process to identify the best grouping of buildings (based on type, age etc.) for a particular purpose using advanced clustering techniques (for instance, Gaussian Mixture Model). This will complement the work in other projects, particularly **‘Tools**

for municipalities to meet carbon targets', which projects the impact of these measures on the future emissions of the city.

Energy simulations of these building archetypes will be used to conduct assessments on the most cost-effective combinations of retrofit measures (for instance, building envelope, building subsystems, on-site renewables etc.). These bundles of retrofit measures will then be financially evaluated and refined together with local industry partners to ensure that they are practical and deliverable. The project will also assess the potential uptake of such packages through consultation with building owners to identify and mitigate possible barriers to uptake. These packages will then form the basis to target key retrofit initiatives for the City of Victoria.

Tasks:

- Comparison of clustering techniques for archetype formulation
- Identify required datasets and perform stock analysis
- Identify retrofit bundles based on archetypes
- Integrate cost analysis with energy and GHG performance of retrofit bundles
- Create a framework to assess the practical implementation of retrofit bundles
- Formulate retrofit scenarios (e.g. electrification of heating) and associated GHG emissions savings
- Identify and track synergies with other sub-projects to maintain an informed learning process.
- Integration into climate solutions pathways.

The positions will be supervised by [Dr Ralph Evins](#) in the [Energy in Cities research group](#). The project is a part of the [ReBuild](#) Initiative with the Pacific Institute for Climate Solutions and [City of Victoria](#) as joint partners. The work will be carried out in the stimulating multi-disciplinary environment of the [Institute for Integrated Energy Systems](#) (IESVic) and the new green [Civil Engineering department](#) at the [University of Victoria](#) on Vancouver Island in beautiful British Columbia, Canada.

How to apply

General requirements

Experience with at least one of machine learning, building energy simulation and meta-heuristic optimization is highly desirable. A good working knowledge of Python is highly desirable for all positions (for an exceptional candidate an expert level in another programming language could be acceptable). Proficiency in the written and verbal use of English is required.

A start date of September 2022 is preferred for **PhD** and **Master** students, but in these challenging times a later start could be possible. **Post-docs** can apply on a rolling basis and could start as soon as possible. Positions are funded at a level comparable with NSERC scholarships ([Master's](#); [Doctoral](#); [Post-doctoral](#)). Holders of these or similar fellowships are eligible for significant top-up funding.

The Energy in Cities group specifically encourages applications from persons with disabilities, visible minorities, Aboriginal Peoples, people of all sexual orientations and genders, and others who may contribute to the further diversification of the University.

We are currently reviewing applicants. Please apply on the ReBuild website under [vacancies](#).

If you have previously applied for a position, do not reapply.

Only apply for one position - you will be considered for all open positions.