Energy

COMPONENT GOALS

01 UBC buildings and landscapes will advance the campus towards net positive energy and greenhouse gas neutrality by reducing energy demand and focusing on site-specific passive design approaches.

02 UBC buildings will have indoor thermal environments that are comfortable and enhance health and wellbeing.

03 UBC will integrate lessons learned to improve building energy performance.

CONTEXT

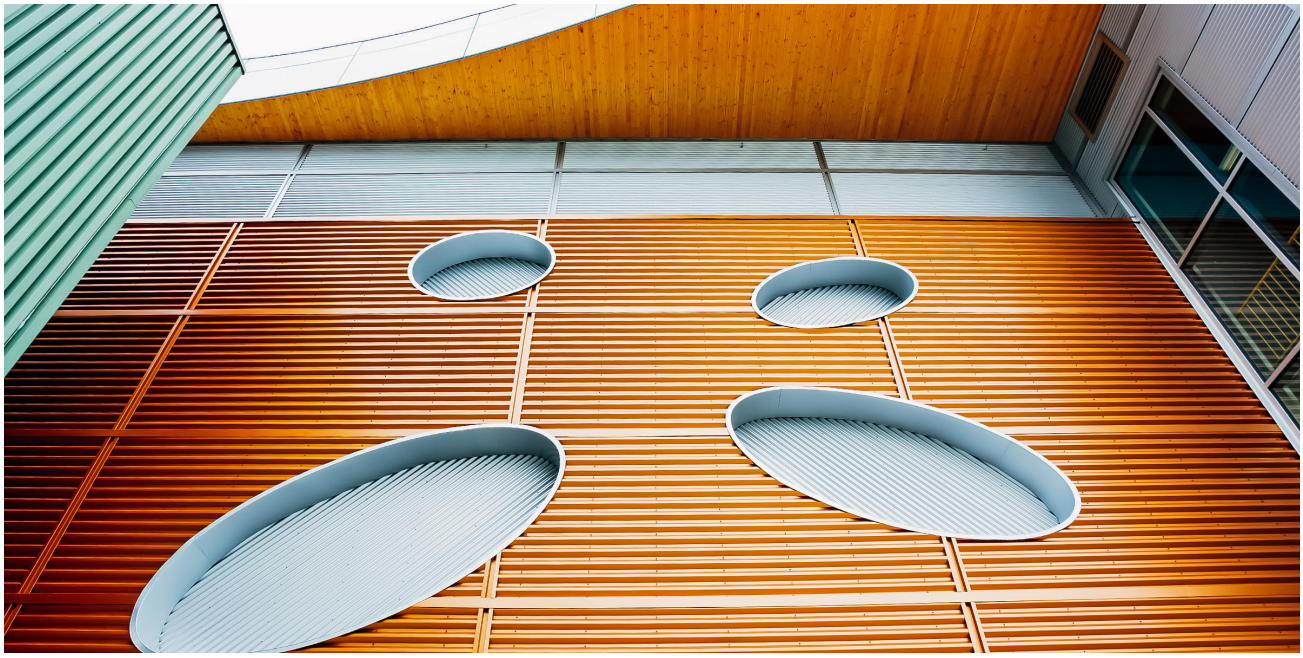
Buildings provide nearly 30% of regional GHG emissions[17] and nearly half of emissions from the UBC residential neighbourhoods.[18]

To achieve improved energy performance and emission reductions along with other sustainability objectives, UBC established the Residential Environmental Assessment Program (REAP) in 2007 as a Land Use Rule.

To identify an energy and GHG reduction pathway in residential neighbourhoods, UBC developed a Community Energy and Emissions Plan (CEEP) in 2013 to set ambitious goals for energy and emission reductions. The CEEP identifies an energy and emissions reduction strategy that will result in a 90% reduction in building GHG emissions by 2050. To achieve this target, the CEEP recommends the establishment of a low-carbon Neighbourhood District Energy System (NDES), improved energy performance measures through REAP, and the implementation of a building retrofit program.

The objective of the NDES is to provide heat and hot water with reduced GHG emissions by providing low-carbon thermal energy for UBC residential neighbourhoods, including Wesbrook Place, East Campus, Acadia Park and Stadium Road. District energy is currently in phase 1 of its development, serving Wesbrook Place using temporary natural gas boilers. Phase 2 implementation will use an alternate energy source, currently contemplated as waste heat recovery from TRIUMF or interconnection with the ADES, which is expected to occur in 2024.

[17] *Metro Vancouver. Greenhouse Gas Factsheet (2013).*
[18] *UTOWN@UBC. Community Energy and Emissions Plan (2013).*



TRIUMF – Advanced Rare Isotope Laboratory. The cooling towers at Triumf presently transfer all of the waste heat into the atmosphere. This waste heat could be used to provide thermal energy via hot water to the NDES.

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UBC is currently working on the balance between building performance and the business case for the development of the low-carbon NDES.

More recently, the Province of BC has instituted the BC Energy Step Code to define a pathway to net zero–ready buildings by 2032. The federal Pan Canadian Framework defines a similar pathway.

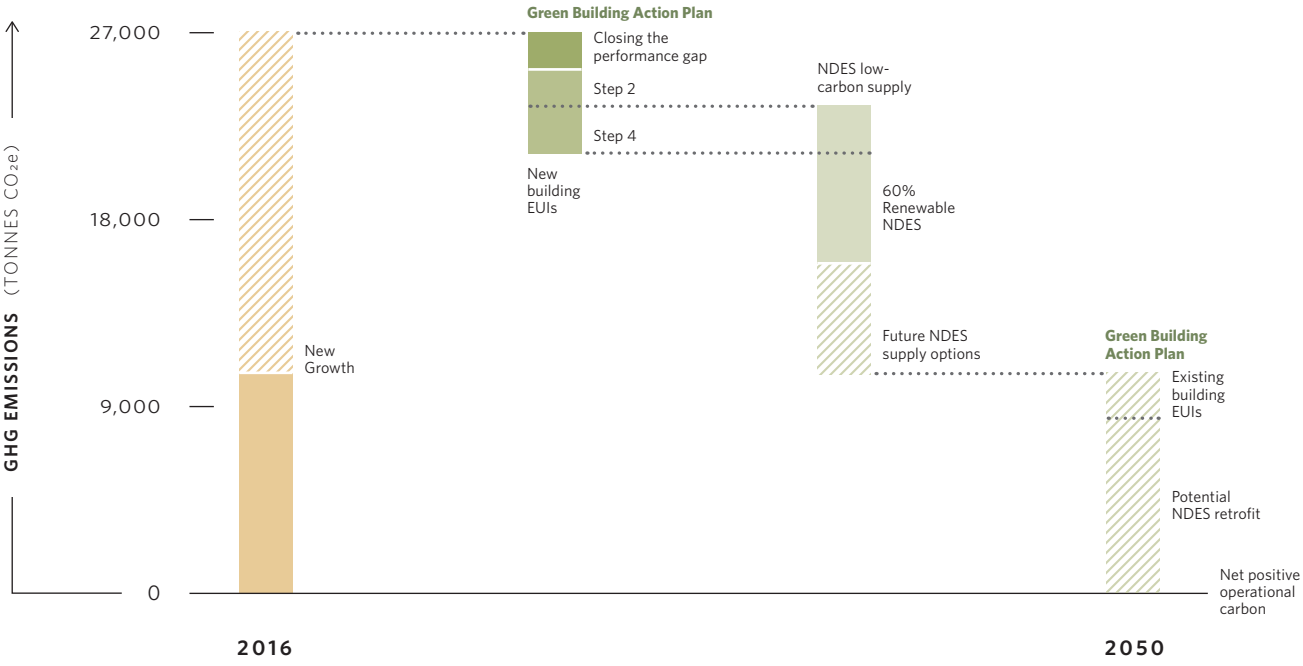

Figure 9. An illustrative graph of UBC's greenhouse gas (GHG) emissions in residential developments and the role of the GBAP in reaching net positive operational carbon by 2050.

Pathway to Net Positive

The CEEP identifies an energy and emissions reduction strategy that will result in near zero building GHG emissions by 2050. To achieve this target, the CEEP recommends the establishment of a low-carbon Neighbourhood District Energy System (NDES), improved energy performance measures through REAP, and the implementation of a building retrofit program. In 2015, the BC Utilities Commission approved the establishment of phase 1 of a low-carbon energy utility—the UBC NDES. Phase 2 planning is in progress and will include a fuel switch from temporary natural gas energy centres to a renewable 60% energy centre in 2024. The CEEP targets a 100% renewable energy centre by 2040.

To achieve improved performance and consistency with other BC jurisdictions, REAP 3.1 energy targets will be aligned with Step 2 of the BC Energy Step Code targets. Step 2 calls for an EUI of 130 kwh/m²/yr and a TEDI of 45 kwh/m²/yr.

Costing studies commissioned by UBC and the Province of BC demonstrate that BC Energy Step Code targets are cost effective for developers to Step 3 of the code *(Table 6)*. The implications of the Step 2 target for REAP considers impacts on future demand and a utility rate for the NDES. The studies identified positive paybacks up to Step 3 of the code, on a life cycle costing basis (net-present value, including energy cost savings).

		UBC STUDY		BC HOUSING STUDY
TYPOLOGY	STEP CODE LEVEL	LOW	HIGH	AVERAGE
LOW RISE	STEP 1	0.0%	0.0%	0.0%
	STEP 2	0.0%	0.1%	0.5%
	STEP 3	0.5%	1.1%	0.6%
	STEP 4	2.3%	4.1%	2.6%
HIGH RISE	STEP 1	0.0%	0.0%	0.0%
	STEP 2	0.4%	0.9%	0.4%
	STEP 3	0.5%	1.4%	0.8%
	STEP 4	2.3%	4.1%	2.4%

Table 6. Incremental capital costs based on costing studies by UBC and the Province of BC.

Key Directions

To ensure residential development is on a pathway to achieving net positive energy and GHG emissions, the GBAP's priority actions focus on the alignment of REAP with the BC Energy Step Code. This includes the implementation of an energy benchmarking monitoring program intended to provide feedback on the realized performance of REAP energy targets and the NDES. Improving the understanding of design measures to maintain thermal comfort under future climate conditions is an emerging priority. A key objective is to achieve GHG reductions across the energy demand and supply spectrum at the lowest total cost of ownership.

FIVE-YEAR IMPLEMENTATION PLAN – SHORT-TERM PRIORITY ACTIONS

- Undertake a study to identify envelope and mechanical design options that achieve comfortable indoor environment under predicted future climate conditions, with priority emphasis on passive approaches where feasible.
- Review feasibility of developing and implementing REAP requirements for existing buildings.
- Implement an energy benchmarking system as part of an ongoing monitoring program.
- Develop GHG intensity targets to ensure cost-effective pathways to zero GHG emissions for buildings connected or not connected to the NDES.
- Develop energy efficiency education programs, including a quick-start for strata councils, to support building owners and residents in partnership with the UNA.
- Mandate incremental energy use intensity (EUI) and thermal energy demand intensity (TEDI) building targets that align with BC Energy Step Code requirements and support the development of the NDES renewable energy centre by 2024.
- Mandate whole building airtightness testing and energy modelling in alignment with BC Energy Step Code by 2018 and set airtightness targets by 2020.
- Develop a program to inform building owners of energy performance through benchmarking reporting by 2020.

TARGETS AND INDICATORS

Target: New residential buildings will meet energy targets to be Net Zero Ready by 2032 in alignment with the BC Energy Step Code.

Indicator: Increase energy efficiency of existing residential buildings through standards and programs.

Central achieved REAP gold Plus and uses passive design features such as increased insulation to reduce energy demand.

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