Energy

COMPONENT GOALS

01 UBC buildings 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 are the greatest sources of energy use and greenhouse gas emissions (GHG) on campus. Reducing building energy use will lower costs for the University (energy costs and carbon offset costs) and reduce GHG emissions, aligning with UBC's Climate Action Plan (CAP).

The Academic District Energy System (ADES) is one of UBC's signature initiatives to substantively reduce greenhouse gas (GHG) emissions. The original aging steam heating system at this campus was replaced with a hot water–based system that will heat approximately 130 buildings. The Bioenergy Research and Demonstration Facility, built in 2012, houses the process of using renewable biomass to generate thermal energy for heating campus buildings. The Campus Energy Centre is the primary energy source for the hot water district energy system, producing thermal energy (hot water).

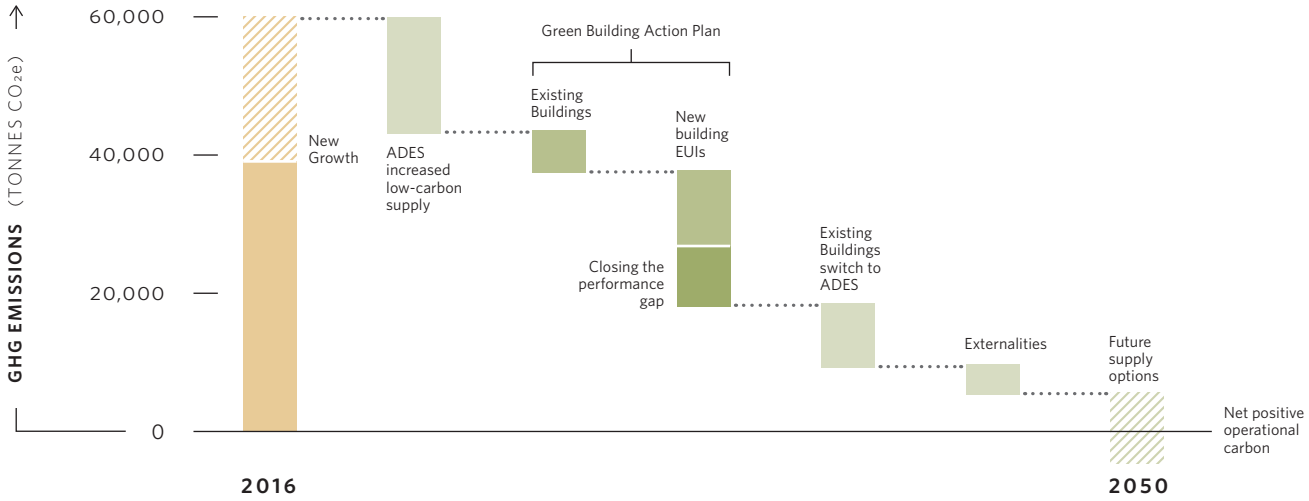

Figure 6. An illustrative graph of UBC's greenhouse gas (GHG) emissions in institutional developments and the role of the GBAP in reaching net positive operational carbon by 2050.

Through its evolving Climate Action Plan, UBC will continue to advance towards an ambitious greenhouse gas emission reduction target of 67% by 2020 and 100% by 2050. Reductions in building energy use and associated greenhouse gas emissions are a key aspect of the Green Building Action Plan, and the plan will be a leader in shifting the marketplace to low-carbon solutions.

Renewable biomass delivered to the Bioenergy Research Demonstration Facility generates thermal energy for the ADES
PHOTOGRAPHER: DON ERHARDT

Key Directions

UBC's new buildings and renewal projects (tier 1, 2 and 3a) will incrementally use less energy over time and achieve net positive GHG emissions by decreasing energy demand through passive design, increasing energy efficiency and meeting energy needs with renewable energy supply through the ADES. Energy targets for different building types and the anticipated incremental reduction over time is shown in Table 4.

Energy targets will be developed individually for each project to reflect the mixture of uses and refined during design development. Existing building retrofits (tiers 3b, 4 and 5) and ongoing operations will look to increasing energy efficiency and switching fuel to lower-carbon sources where possible.

UBC is committed to improving building performance by understanding occupant behavior and operator concerns and by increasing the stringency of compliance measures (such as requirements for airtightness testing and improved modelling of thermal bridging) to close the gap between predicted and actual energy use. UBC Energy and Water Services monitors building energy performance and works to identify actions (such as control upgrades) to improve performance and reduce the energy performance gap.

In addition to having ambitious energy targets, designing thermally comfortable indoor environments that are resilient to climate change is necessary to provide welcoming spaces that enhance the health and wellbeing of occupants.

INSTITUTIONAL ENERGY TARGETS

	STUDENT HOUSING			HIGH-INTENSITY SCIENCE BUILDING			LOW-INTENSITY SCIENCE BUILDING			OFFICE, CLASSROOM AND/OR LIBRARY		
	TEDI	DHW	EUI	TEDI	DHW	EUI	TEDI	DHW	EUI	TEDI	DHW	EUI
CURRENT	40	30	130	65	15	380	45	15	200	40	5	140
2020	30	30	120	55	15	370	35	15	190	30	5	130
2025	20	30	110	45	15	360	25	15	180	20	5	120
2030	15	30	95	35	15	350	15	15	170	15	5	115

Table 4. Energy targets for tier 1 and 3a institutional buildings.

FIVE-YEAR IMPLEMENTATION PLAN — SHORT-TERM PRIORITY ACTIONS

- Identify passive and mechanical design requirements for buildings of different uses and space criteria that achieve comfortable indoor environments under predicted future climate conditions.
- Develop cost-effective low-carbon cooling strategies (including consideration of district cooling) to address thermal comfort needs at UBC.
- Establish mandatory incremental energy use intensity (EUI), thermal energy demand intensity (TEDI), and consider development of thermal demand (W/m²) and GHG Intensity (kgCO2e/m²/yr) targets for tier 1 and tier 3a projects.
- Require whole-building airtightness testing in alignment with BC Energy Step Code.
- Develop and implement a Smart Building Strategy and revise Monitoring Based Commissioning and Commissioning Technical Guidelines with results from the Smart Commissioning pilot projects.
- Develop a strategy and implement policies and procedures during building design to improve operability and maintainability as well as reduce the cost of ownership of energy-related systems in new construction projects.

The Bioenergy Research & Demonstration Facility (BRDF) houses the process of producing renewable heat for the university

ARCHITECT: LARRY MCFARLAND ARCHITECTS
PHOTOGRAPHER: PHILIP BERTOGG

TARGETS AND INDICATORS

Target: New institutional buildings will meet incrementally reduced energy targets to be Net Positive Ready by 2030.

Target: Reduce average building thermal energy use intensity (TEDI plus DHW) for campus buildings by 50% to 75 kwh/m²/yr by 2050.

Target: Reduce the performance gap between modelled and metered energy use in new institutional buildings by 75% within three years of occupancy by 2020.

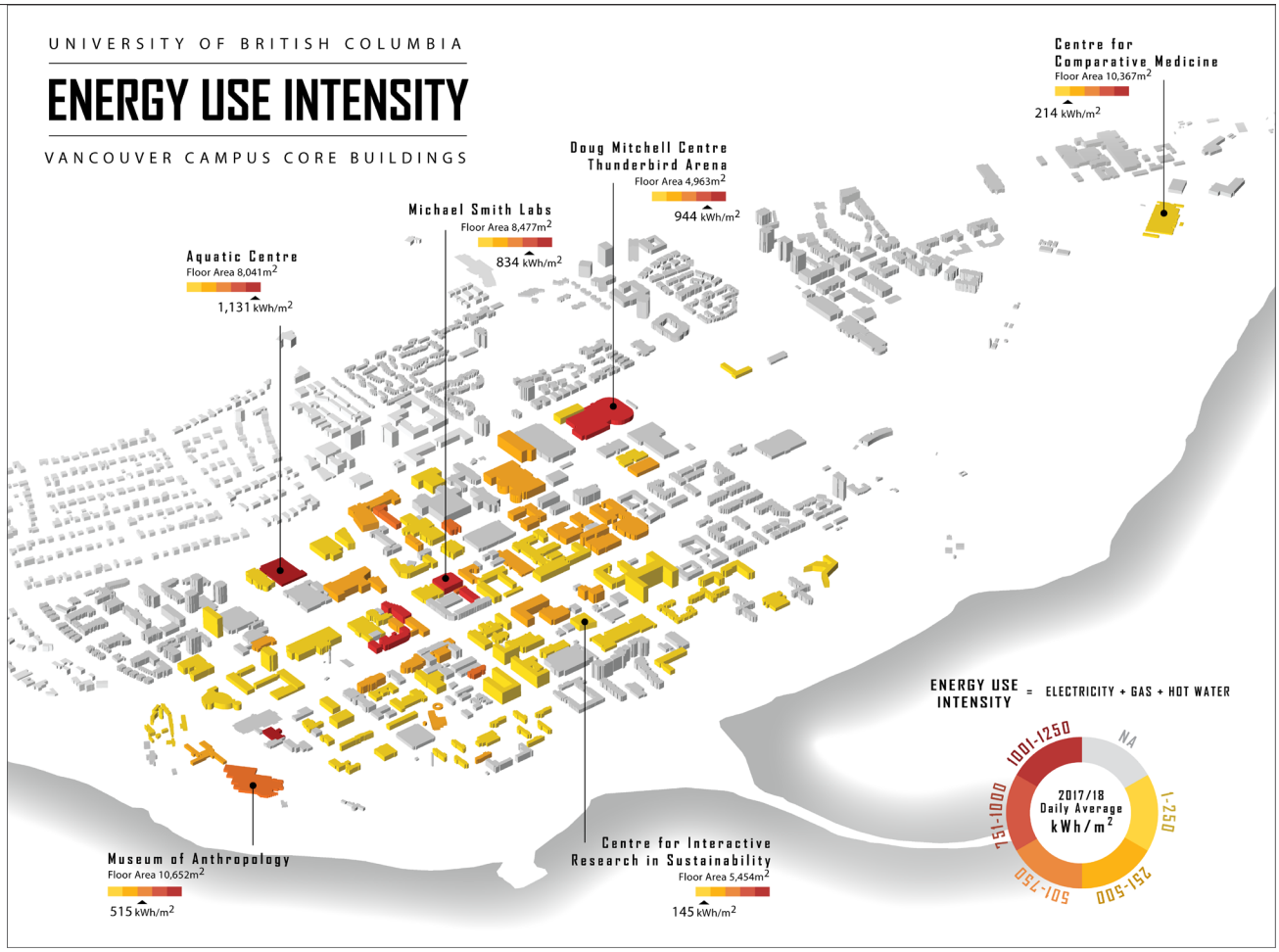

Figure 7. Current campus building energy use intensities (EUI's) illustrating how different uses effect energy use.

The Campus Energy Centre provides energy for the ADES serving 130 buildings **ARCHITECT:** DIALOG **PHOTOGRAPHER:** PHILIP BERTOGG