Energy conservation and demand management plan: St. George campus

Prepared for the Sustainability Office, St. George campus

Facilities & Services

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Executive summary

The University of Toronto, and particularly the St. George campus, is a research-intensive collection of facilities, staff and students. It consists of over 120 buildings ranging in age from brand new to almost 200 years old on 72 hectares of urban land. The campus is growing in floor area, and the number of staff and students will continue to grow over the next ten years and beyond. As a result of the size, population, diversity of operations and utility needs, a great deal of energy is used to keep the community that uses the campus comfortable throughout the year.

Responsibly managing growth and operations is vital to sustainability at the St. George campus. Focused energy reductions efforts that were rooted in the 2019 CDM (2019–24) through efficient design, optimization, and on-going performance validation. Over the last five years, electrical use has been reduced by approximately 7,900 GWh and thermal energy by approximately 94,000 mmBTU for a total of 35,400 eGWh. This has avoided a total of over a total of 70,000 tonnes eCO_2 emissions.

In 2018, U of T committed to a 37% reduction in greenhouse gases (GHGs) emissions by 2030 across its three campuses, below a 1990 level baseline. The downtown Toronto St. George campus currently represents over 80% of U of T's total emissions. To meet tri-campus commitments, the St. George campus will need to achieve significant GHG and energy reductions over the next 10 years and beyond.

This energy and conservation demand management plan for the St. George campus supports our energy production, distribution and conservation goals as outlined in U of T's tri-campus low-carbon action plan (2019–24) released summer 2019. As such, the CDM plan for 2019-24 was focused on scope 1 and 2 GHG reductions resulting from energy savings initiatives. Furthermore, the U of T St. George campus' climate-positive master plan released in 2021 set a new target: to reduce more GHG emissions than we emit. In other words, U of T will become climate positive before 2050.

This CDM covers the period between 2024 and 2029 and provides an overview of the type of strategies and projects planned for the next five years, given information currently available. To advance GHG reductions, the St. George campus will need to improve the performance of its existing building stock and manage growth by optimizing the use of our existing spaces, as well as designing any new buildings or major renovations to high performance standards with respect to carbon and energy intensity. Thermal energy savings, which yield higher GHG reductions when compared to electricity, are expected to increase compared to the previous CDM due to an emphasis on greenhouse gas reduction goals that are driving planned reductions for the 2024–29 period.

Developing teams with internal building science expertise, leveraging our Utilities Revolving Reduction Fund, designing to high performance standards, support from partners, engaging building occupants and continuous monitoring and analysis will advance operations and position U of T on a path towards achieving its GHG reduction target.

Introduction and background

The University of Toronto is committed to providing a world-renowned campus where students, faculty and staff thrive in vibrant, safe and sustainable environments. The Facilities & Services team that operates the St. George campus aims to create spaces that foster learning and discovery by harnessing the power of partnerships, people, technology, innovation and passion. Our history of efficient operations through a culture of optimized energy management combined with our commitment to significantly reducing our greenhouse gas (GHG) emissions by 2030 supports the plan presented in this energy conservation and demand management (CDM) document.

The results of our efforts over the last five years and opportunities for future initiatives during the next five years are described. Given that our targets for 2030 and beyond are GHG based, we will focus on projects that maximize GHG reductions in a mix of thermal (high-GHG content) and electricity (low-GHG content) projects in an integrated and responsible way. Like the 2019 CDM, projects are planned and then must go through rigorous business case development and evaluation before final pricing and scheduling can be confirmed. Key criteria as we develop these business cases include improving the comfort, well-being and other sustainability elements that impact our students, staff and faculty over the long term.

Conservation & Demand Management regulation (O. Reg. 507/18)

The original legislation for CDM reporting, O. Reg. 397/11, was repealed in late 2018 and replaced with O. Reg. 507/18 “Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans”, made under the Electricity Act, effective January 1, 2019. As a post-secondary educational institution, the University of Toronto “shall prepare, publish, make available to the public and implement energy conservation and demand management plans or joint plans in accordance with section 25.35.2 of the Act and with this Regulation.” The requirements of the act and regulations include a summary of our annual energy consumption and GHG emissions along with a description of “previous, current and proposed measures that” reduce the demand for energy and GHG emissions. This document presents the information required and will be made available on the U of T website on July 1, 2024. A printed version will be made available to the public at the Facilities & Services head office, 255 McCaul St., fourth floor, Toronto, Ontario.

Note that throughout this report the U of T fiscal years are used. Our year starts May 1 and finishes April 30 each year, unless otherwise stated.

Profile: University of Toronto, St. George campus

College and university campuses are unique in terms of the variety and complexity of their facilities operations. Perhaps no other type of organization under one management has a more diverse facility infrastructure. Here at the St. George campus, in the heart of downtown Toronto, we serve a student population of over 62,000—the largest single campus student population in North America. Daily occupancy can exceed 100,000 people, placing the St. George campus in line with the 50th-largest municipality in Canada by population.

Due to the sheer geographical size (St. George campus sits on approximately 72 hectares), urban location, extensive district energy system, diversity and complexity of the built environment, the St. George campus is often described as a “city within a city.” We manage and provide utilities to over 120 buildings that are widely diverse in age, size, design and function. Beyond the significant diversity of the portfolio, the St. George campus has an extensive district energy system (DES) and network which supplies heat, electricity, and chilled water to most of the campus buildings through kilometres of underground tunnels. This is a very efficient way to provide energy to such a wide variety of buildings on a large campus such as St. George. It also presents

many opportunities to optimize energy generation, distribution and consumption that benefit the performance across a large range of buildings.

Goals and objectives

In 2018, U of T joined the University Climate Change Coalition (UC3), a group of leading research universities in North America committed to reducing GHG emissions in their campuses and communities. In line with this commitment, U of T set a goal to reduce absolute GHG emissions 37% by the year 2030, below 1990 baseline levels. Our plan described in this CDM indicates we are not only on track to meet this target, but also, we are accelerating our decarbonization efforts to cut our emissions in half by 2027 from a 2023 baseline by launching Project Leap, a massive infrastructure renewal project currently under construction.

Existing building stock

The St. George campus is comprised of more than 120 buildings ranging in size from 165 m2 to 80,000 m2, with an average building age of 70 years. A large majority of the buildings that will be here in 2030 are already built—and as we prefer to keep our properties and systems, must ensure that they are efficiently designed for the long lives we expect. Many of our buildings are designated as heritage sites or represent important architectural designs (which can pose challenges when attempting to implement conventional energy conservation measures). The wide variety of facilities in an urban setting requires that we prioritize the buildings to address first, develop solid business cases, consider solutions that achieve the best return on investment and, ultimately, improve the educational experience at this world-renowned university.

Baseline consumption

The St. George campus uses energy in many forms—electricity, natural gas, steam, high temperature water, low temperature water and chilled water—to provide comfort to a wide range of building types, ages and uses. The St. George campus generates and supplies these utilities across the campus, the majority from a centralized plant. About 20% of the campus electricity is supplied by a 6-MW natural gas fired cogeneration unit that also makes steam from the waste flue gas energy. The balance is supplied from our local distribution company, Toronto Hydro.

About 212 GWh of electricity (including cogeneration) and 1.4 million mmBTU of natural gas was used in 2021/2022. The energy required is dependent on a number of variables, such as weather, student/staff/faculty population, behaviour, ongoing growth, special events, maintenance and equipment down-time. We also supply energy to outside facilities like the Royal Ontario Museum, Gardiner Museum and federated colleges which we do not directly control but impact our energy and GHG indices.

U of T is a growing urban campus. From 2014 to 2018 the gross floor area increased by 7% due to new construction with a student population increase of 5% over the same period. The campus may grow by 30% in GSM by 2030, based on current projections.

With the utility savings comes reductions in GHGs as well for both scope 1 and scope 2. Thermal energy represents about 90% of the GHG loads (scope 1) with electricity at about 10% (scope 2). Thermal energy, predominantly supplied by burning natural gas, creates the most GHG emissions and is relatively inexpensive compared to electricity (which, on the other hand, is low carbon and five times cleaner, but ten times more expensive). Striking a balanced energy mix is important as we plan forward, increasing electricity use where possible and targeting conservation of natural gas for maximum GHG reduction.

Table 1: *Summary of energy use and GHG emissions for the St. George campus*

Fiscal Year	UTSG GSM	Student FTE	Electricity Purchased kWh	Electricity GHG eCO2 Tonnes	Thermal Consumption mmBTU	Thermal GHG eCO2 Tonnes	Total GHG eCO2 Tonnes	eCO2 kg/GSM	kWh/GSM	mmBTU/GSM
2014/15	1,365,881	52,777	198,258,000	13,878	1,724,671	94,605	108,484	79.4	145.15	0.051
2015/16	1,383,463	54,448	188,437,000	11,306	1,533,762	83,566	94,873	68.6	136.21	0.046
2016/17	1,396,373	54,751	186,508,000	7,460	1,545,290	84,235	91,695	65.7	133.57	0.044
2017/18	1,419,589	55,290	182,814,507	7,313	1,601,155	87,725	95,038	66.9	128.78	0.048
2018/19	1,438,918	55,918	214,073,333	8,563	1,420,353	79,774	88,337	61.4	148.77	0.045
2019/20	1,426,873	57,008	178,658,859	7,146	1,525,720	85,604	92,750	65.0	125.21	0.039
2020/21	1,426,194	58,704	153,100,855	6,124	1,457,083	81,888	88,012	61.7	107.35	0.032
2021/22	1,426,566	59,272	171,553,446	6,347	1,445,460	81,541	87,889	61.6	120.26	0.039
2022/23	1,426,566	61,114	173,114,990	7,444	1,485,694	83,776	91,220	63.9	121.35	0.038
2023/24	1,426,566	62,307	177,380,055	7,627	1,380,454	77,822	85,449	59.9	124.34	0.034

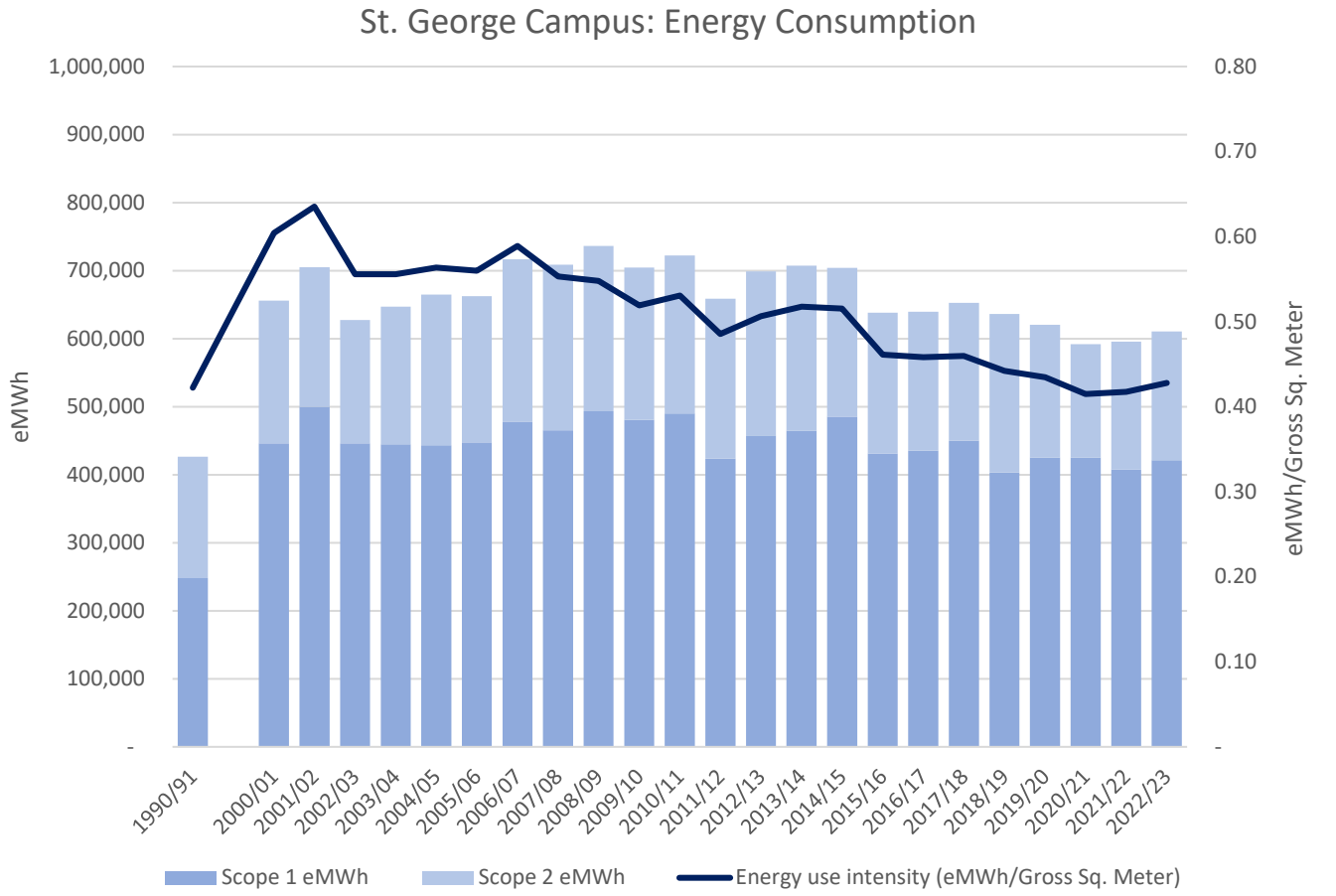


Chart 1: History of total energy use in ekWh and ekWh/GSM from 2000/01 to 2022/23

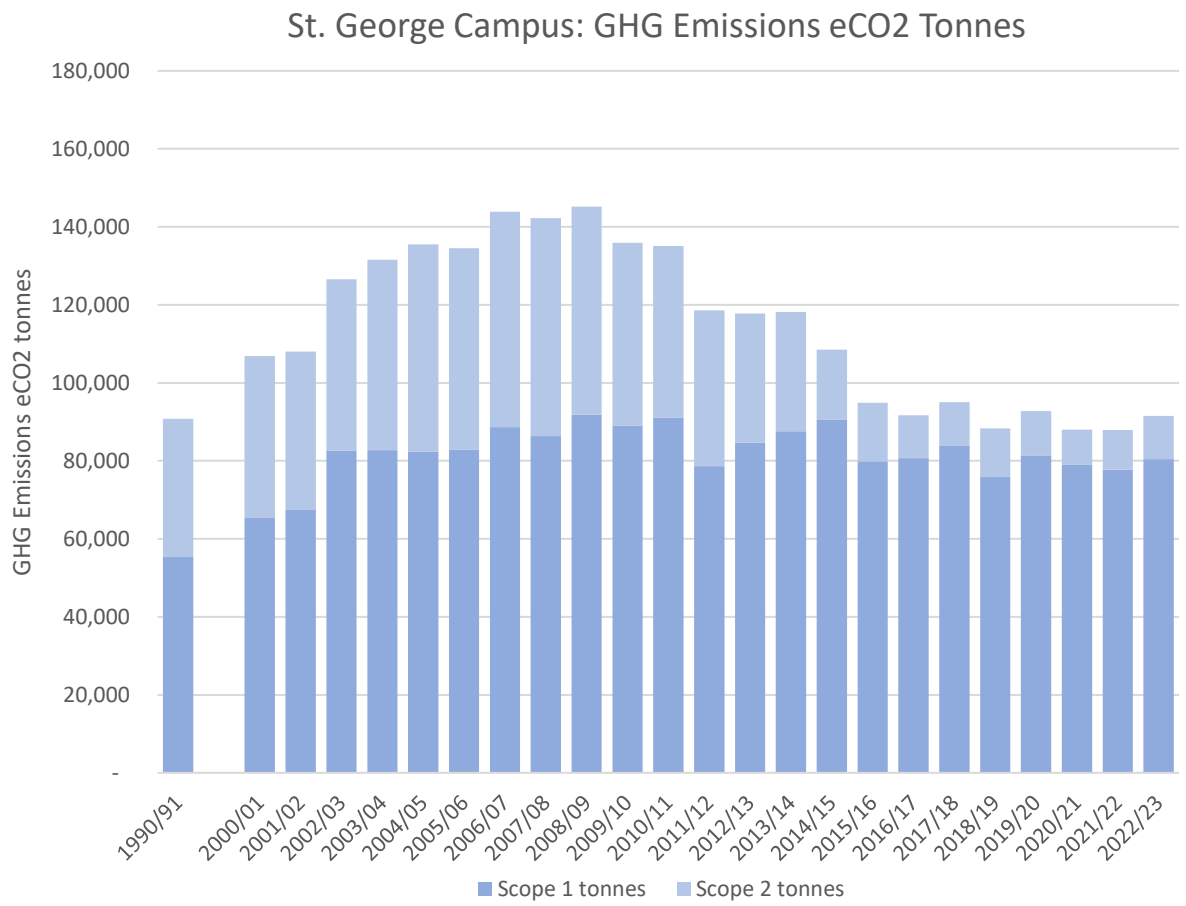


Chart 2: Summary of Scope 1 and Scope 2 GHG emissions at St. George campus

Updates to the 2019 CDM Plan

This report provides an overall summary of the measured reduction values to date relative to the values in the 2019 CDM plan. Table 2 below identified the status to date of those measures on our campus energy and carbon emission reductions.

In the next five-year CDM plan, we not only continue improving the existing operational GGRP measures in place but also provide more comprehensive energy efficient measures to dramatically reduce carbon emissions.

Table 2 Summary of conservation projects completed from 2019 to (early) 2024

Project	**Description**	**2019-24 targeted annual GHG reduction tonnes eCO2**	**Actual annual GHG reduction tonnes eCO2**
Greenhouse Gas Campus Retrofit Program (GGRP)	In 2018-19, leveraged provincial funds to implement and complete projects ranging from rooftop solar, building controls, and increased heat recovery capacity.	5,592	4,785
Geoexchange systems	Using the heating/cooling properties of the earth via boreholes to heat buildings during the winter and cool them during the summer.	15,000	-
Renewable (solar electric and hot water)	New solar panels will be installed reducing the use of electricity from the grid and will also be used to heat water for pools and showers.	175	61
Distribution (heat recovery)	Capture of waste heat normally exhausted from the Central Steam Plant's stack to heat various buildings.	2,000	2,461
Building optimization	Improved building control systems, replacement of old equipment with high efficiency HVAC equipment, low temperature hot water heating, capturing and reusing heat within buildings.	6,000	-
High performance building design standards - new and retrofits	All new buildings and construction will be designed to be 40% better than ASHRAE standard 90.1.	8,325	6,500
Lighting	Replacement of interior and exterior lights with more efficient LEDs.	1,000	206
Trees - All U of T canopy capture	Implementing an active forest management strategy ensuring the long-term growth, maintenance and health of the university's canopy.	Tri-Campus	500
	Total GHG reduction	**38,092**	**14,513**

Table 2 above summarizes conservation projects completed between 2019 and 2024 and the resulting annual energy and GHG reductions. These projects total over 35,488 eGWh/year (7,897 GWh/yr of electrical savings, 94,000 mmBTU/yr) of thermal savings and an associated GHG reduction of 14,513 tonnes eCO_2/year. It is important to note that carbon emissions reductions for certain initiatives, such as the geoexchange system and building optimization, have been deferred to the next cycle. This decision was made strategically to further optimize these reductions with the development of the district energy network system in Project Leap, as outlined in the next section.

Active conservation measures reduce energy for the long term and therefore intended to be permanent. Passive measures due to behavioral changes are not easily quantified but are a part of our conservation initiatives and strategy. Other unmeasured savings can be attributed to weather, scheduling, events, ongoing system upgrades, small projects and deferred maintenance.

During approximately 2.5 years of the last period (2019–24), the COVID-19 pandemic had profound and unprecedented effects on campuses and society worldwide. Upgrading mechanical systems and optimizing building automation systems became critical and were adjusted to operate under the “new normal” pandemic conditions.

Buildings needed to swiftly adapt to changing conditions (e.g., adequate and safe ventilation rate, reduced occupancy). Building automation systems were reprogrammed to support safe operations during viral pandemics and energy efficiency during reduced occupancy. The pandemic prompted campuses and society to rethink building operations to emphasize safety, flexibility and sustainability. The lessons learned during this period will shape future building designs and operations.

Ongoing and proposed measures: Five-year plan (2024-29)

U of T embarked on a plan to meet our 2030 goal of reducing the GHG levels to 37% below the levels in 1990 in absolute terms. Building on the low carbon action plan (2019–2024), the U of T climate-positive campus plan proposes a collection of conservation and efficiency programs to put us on the path to achieving this target. It will speed up the university's efforts to make the St. George campus climate-positive, reducing more greenhouse gases than it emits before 2050. Our goals are:

- Responsibly manage the growth of our campus to mitigate the environmental impacts of more space and activity.
- Renew existing and aged utility infrastructure to ensure future performance that supports academic and research excellence.
- Build resilient low-carbon systems to support our carbon reduction targets with reliable infrastructure by changing how our campus produces, distributes, and consumes energy.

Table 3: A summary of the activities being developed and pursued between 2024 and 2029

Project	Description	Targeted GHG reductions (tCO2e/year)	Targeted energy savings (ekWh/year)
Project Leap	This project is the first step in our climate-positive master plan, and currently, the project is under construction. The project's scope of work includes: District energy modernization • Natural gas heating with electric boilers & industrial heat pumps • Central Steam Plant renewal and efficiency • Demand management & resiliency assets • Tie to geoexchange and energy storage, CHP, and district energy network Building retrofits • Building energy optimization • Active heat recovery • Landmark geoexchange • Full fit mechanical fit out of heat pumps • Enables active heat recovery of lab exhaust	48,738	135,702,550
Deep energy retrofit	This project adapts the previous Project Leap business model to extend the deep energy retrofit projects to additional energy-intensive buildings.	2,747	10,060,630
Renewable (solar electricity)	New Solar PV panels will be installed, reducing the use of electricity from the grid via a net-metering system.	222	605,000
Building optimization (ISO50001 implementation)	U of T has been embracing the ISO5001 Energy management system since 2021. The international energy management	100	600,000

	system standard provides a new framework for the university to promote U of T's energy efficiency objectives, address its climate change goals, and directly support the site utilities master plan development. This implementation will enable U of T to establish the systems and processes necessary to continually improve energy balance, as well as the identification, tracking, and reporting of its building's energy balance selectively and collectively. Implementing the ISO 50001 energy management systems standard at U of T holds significant promise for achieving several positive outcomes. The initial seven buildings will target a 2% annual energy savings and continuous improvement.		
High-performance building design standards – new buildings and renovations	All capital projects, including new buildings and renovations, will be designed to the high-performance levels of the tri-campus energy modeling and utilities performance standard	1,300	13,100,000
	Total targeted annual savings by 2029	**53,000**	**160,067,550**

Technical measures

Project Leap

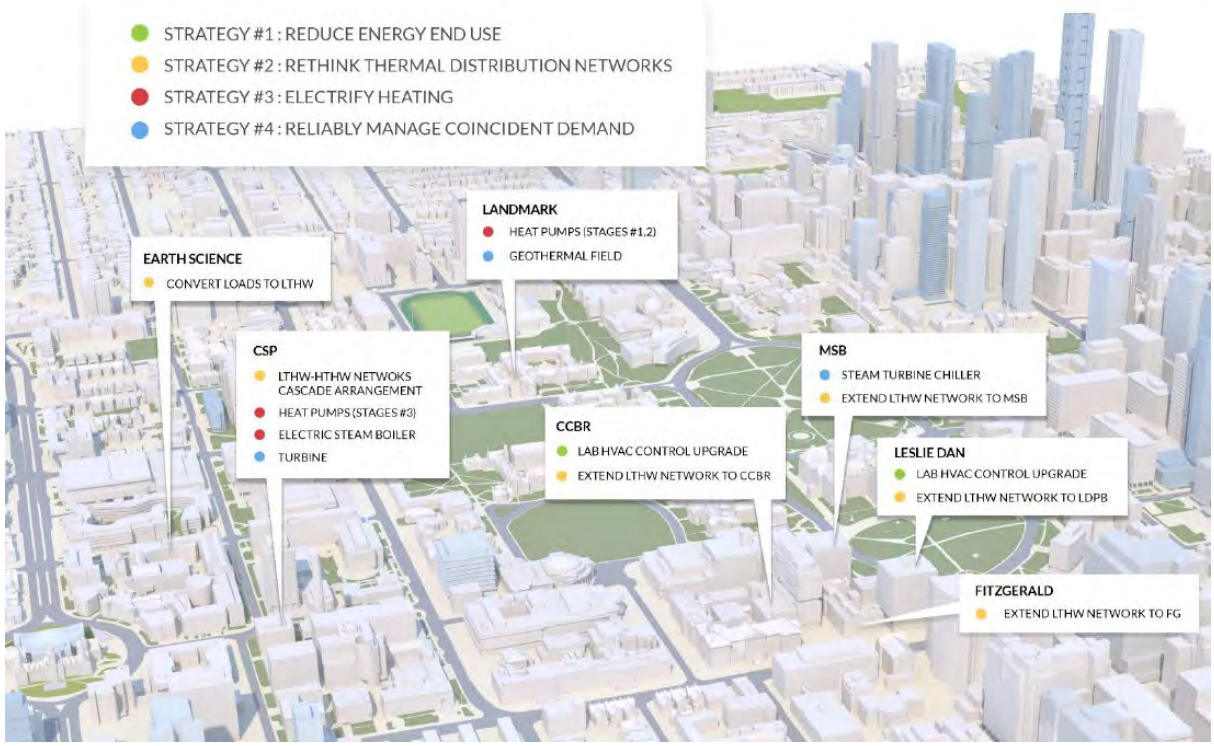
U of T is accelerating efforts to decarbonize its St. George campus through a massive, $138-million infrastructure project that will cut campus emissions in half within three years.

Project Leap, the first strategic step of the climate positive campus plan, will begin phasing out natural gas in favour of electricity in the campus's central steam plant and carry out deep energy retrofits in several of our most energy-intensive buildings.

Project Leap technical strategies

There are four strategies integrated into a solution that tackles the challenge of renewing aged utility infrastructure to provide a sustainable and resilient backbone for the campus while enabling U of T to responsibly manage growth after Project Leap.

- Strategy 1: Reduce energy use at the building level
- Strategy 2: Rethink thermal distribution networks
- Strategy 3: Electrification of heating
- Strategy 4: Reliably manage coincident demand



Implementation of strategy 1 at the building level allows for correctly sizing the assets that will support strategies 2 and 3. Heat will no longer be primarily generated through natural gas steam boilers at the Central Steam Plant and distributed downstream to buildings.

The proposed approach is a new energy ecosystem where heat is recovered from buildings and distributed upstream through the repurposed piping networks and ultimately transformed into useful thermal energy by new nodal heat pumps.

Maximizing heat recovery opportunities in Project Leap will reduce future reliance on electric boilers (higher OPEX) or GSHPs (higher CAPEX), thereby capitalizing on the benefits of a nodal approach. Finally, strategy 4 will protect the university from the inevitable variability in power pricing structures, adding significantly to the financial resiliency of the energy infrastructure.

Currently, the project is in its implementation phase. The following timeline chart exhibits the key phases over the course of the entire project.

***Chart 3**: Project Leap timeline. The project scope includes the key energy, carbon emissions and water reduction measures presented below.*

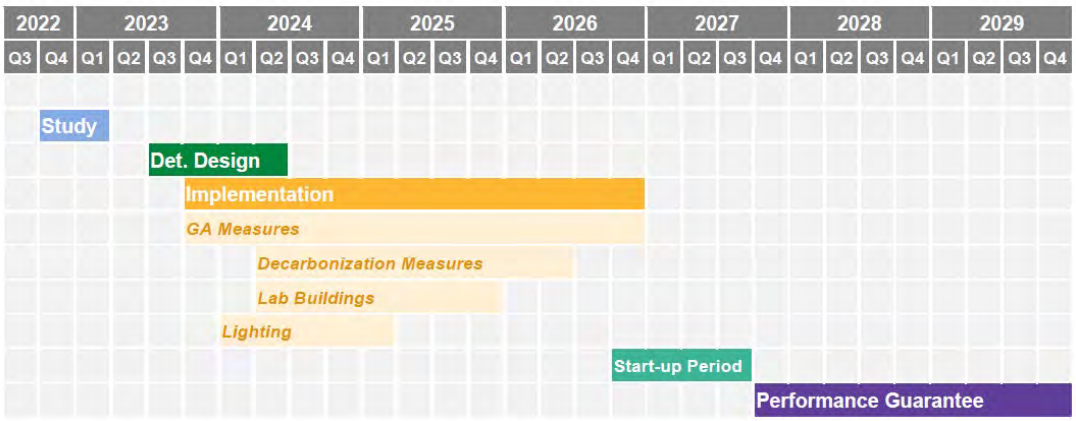


Table 4: *A summary of the active measures being developed by Project Leap*

Measure name	Summary description
Electric steam boilers	Removal of gas fired steam boiler and replacement with two electric (electrode) steam boilers (2 x 15 MWe)
Existing assets new operation	Re-purpose the existing 6.5 MW gas turbine cogeneration unit (GTG1) from continuous operation to operating in demand response mode only. Discontinue normal operation of steam chiller and operate as peak shaver
Central Steam Plant heat pumps	The installation of one high temperature heat pump modular bank with heating capacity of 4.0 MW
Landmark geoexchange system integration	Maximize the geo-exchange field by fully building out the geo-exchange plant with heat pumps to supply LTHW and CHW to buildings.
Thermal energy distribution	Supply new networks to existing buildings and / or modify existing networks for them to be compatible with the new operating conditions of the centralized chilled water (CHW) and low temperature hot water (LTHW) networks
Building HVAC — water-side – Terrence Donnelly Centre for Cellular & Biomolecular Research (CCBR)	Install a parallel heating system connected to the low temperature hot water (LTHW) network to supply air handling unit (AHU) preheating as well as offsetting steam use for the constant and scheduled hot water networks. Replace runaround loop heat recovery system with chilled water to enhance heat recovery and increase LTHW during the heating season.
Building HVAC — air-side CCBR	Deep energy retrofit solution to building air-side HVAC systems that comprises a laboratory VAV system and heat recovery enhancement
BAS & EMRS — CCBR	Replacement of existing majority Siemens controlled BAS with new BAS Standard acceptable technology including miscellaneous integration of existing technologies, and their overall presentation to EMRS via F&S VLAN
Water fixture retrofits — CCBR	All high-flow domestic water (DW) fixtures will be retrofitted with new low-flow fixtures. Steam sterilizer units will be retrofitted with hot effluent/condensate cooling reservoir systems and temperature-controlled valves to minimize the domestic cold water required to quench the discharge to an acceptable temperature before entering the building's sanitary system
Building HVAC – water-side — Leslie Dan Pharmacy building (LDP)	Connect the building to the Landmark Network with a new low temperature hot water (LTHW) connection that will feed into the AHU preheat glycol system as well as the terminal reheat and perimeter hot water systems when the set points are aligned with the LTHW network. During the winter, the system will recover energy from the exhaust by connecting it to the chilled water network that will provide capacity for the LTHW heating plant

Building HVAC – air-side — LDP	Deep energy retrofit solution to building air-side HVAC systems that comprises: • Laboratory VAV system • Heat recovery enhancement • Strobic fan variable speed drive
BAS & EMRS — LDP	Replacement of existing BAS with new technology including miscellaneous integration of existing technologies.
Water fixture retrofits — LDP	All high-flow domestic water (DW) fixtures will be retrofitted with new low flow fixtures. Steam sterilizer units will be retrofitted with hot effluent/condensate cooling reservoir systems and temperature-controlled valves to minimize the domestic cold water required to quench the discharge to an acceptable temperature before entering the building's sanitary system.
Building HVAC – Water-side — Medical Sciences Building (MSB)	Run new chilled water piping from Landmark to the MSB Chiller plant to provide added capacity and redundancy. Run new Low Temperature Hot Water ("LTHW") piping from Landmark to MSB to replace the existing Sofame connection and offset greater amounts of steam heating.
Building HVAC – Air-side — MSB	Deep energy retrofit solution to building air-side HVAC systems comprising a penthouse heat recovery system using new exhaust air heat recovery units.
Demand response system	Modify controls architecture and strategy to reduce energy on demand to reduce carbon impact when the electricity grid is most carbon intensive.
Lighting retrofits	Replace all remaining non-LED lighting with LED lighting.

Deep energy retrofit program

This program is another important piece of our climate positive campus plan. A five-year deep energy retrofit plan is aiming to launch a retrofit program every year with one to five buildings targeting high-priority buildings. The performance-based procurement process evaluates the KPIs and deliverables meeting the targets: 80% GHG emissions reduction for scope 1&2 GHGs, 40% EUI reduction, and addressing critical deferred maintenance items. The maximized positive NPV ensures the capital investment decision.

The figure below illustrates the project timeline and key components.

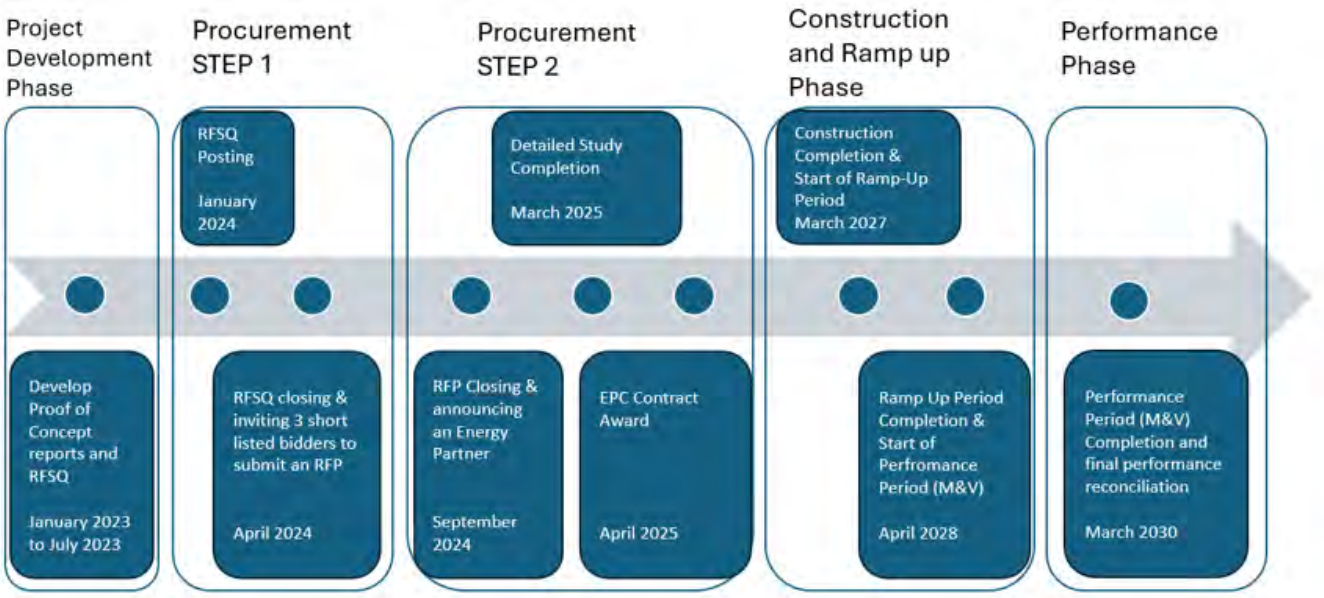


Table 5 below illustrates the high-level scope.

Table 5: *Deep Energy Retrofit program measures*

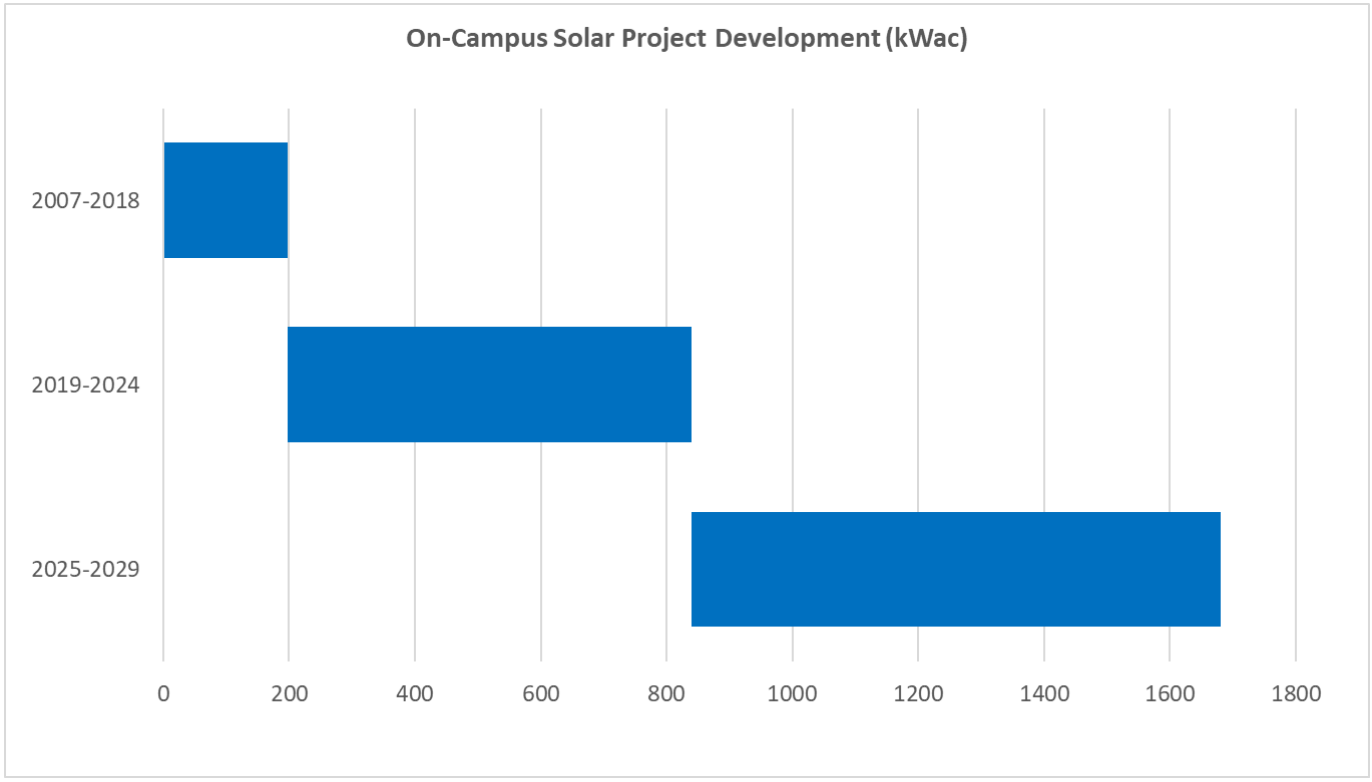
Building	**ECM/Modernization**
Dentistry	• Lightng retrofit • Electrification of heating using heat pumps assisted by active heat recovery • Electrification of DHW • Electrification of humidification • Electrification of process steam • Refurbishing of AHUs • BAS expansion and upgrades
Rehabilitation Sciences	• Lighting retrofit • Electrification of heating using heat pumps assisted by active heat recovery -BAS upgrade
McCaul St. Complex	• Exam Centre and Old Admin Building lighting retrofit • Exam Centre, Old Admin Building, and HSB electrification of heating using heat pumps assisted by active heat recovery- Electrification of DHW • BAS upgrade and DCV implementation for all three buildings • Implementation of renewables • Upgrade rads in Old Admin

Renewable energy: On-campus generation

U of T has renewable energy systems that have been in operation for over a decade now including photovoltaics (PV) and solar hot water systems contributing to domestic hot water loads since 2008. In line with our commitment to increase our renewable energy production, two significant solar PV systems have been installed on campus buildings; one was the BCIT solar roof array with a capacity of 160 kWac in 2021. Subsequently, in 2023, we deployed the other large solar array with a capacity of 370 kWac on our UTL building. These installations, along with the existing systems, generate renewable electricity behind utility meters, thereby contributing to the mitigation of campus carbon emissions. Our on-campus solar electricity generation capacity history and development roadmap is presented in the chart below. The total onsite solar PV capacity is projected to be 1.7 MW by 2029, aligning with the strategic objectives in our climate-positive campus plan.

The energy collected is used to offset electricity in the buildings (net metered electricity) in the case of photovoltaics and displace natural gas in the case of solar hot water systems. The challenge for installing more solar systems is the state of the roofs. Although we may have a large total roof area to select from, many roofs are not structurally sufficient for the added weight of the arrays. Other normal design considerations like access to the loads, available area, and shading prevent the use of solar energy on many buildings.

***Chart 4**: On-campus solar project development*



Implementation of ISO 50001 energy management system

U of T has been embracing the ISO 5001 energy management system since 2021. This international standard provides a new framework for the university to promote its energy efficiency objectives, address its climate change goals, and directly support the site utilities master plan development. The implementation will enable U of T to establish the systems and processes necessary to continually improve energy performance, while identifying, tracking, and reporting its building's energy use selectively and collectively.

Implementing the ISO 50001 energy management systems standard at U of T holds significant promise for achieving several positive outcomes. By aligning ISO 50001 practices with U of T's broader sustainability initiatives, the university can:

1. Climate-positive campus plan Integration: ISO 50001's energy efficiency practices contribute directly to U of T's goal of achieving net-zero greenhouse gas emissions by 2050. ISO 50001 serves as a multifaceted solution, benefiting U of T's climate goals, staff competence, and broader sustainability efforts.

2. Enhancement to Project Leap: ISO 50001 synergizes with Project Leap. Both initiatives share common themes of collaboration, innovation, and environmental impact. Integrating ISO 50001 practices into Leap enhances U of T's ability to achieve deep energy retrofits, reduce emissions, and lead by example.

3. Minimize greenhouse gas emissions: ISO 50001 encourages practices that reduce carbon emissions, aligning with U of T's climate-positive goals.

4. Enhance competitiveness: ISO 50001 implementation enhances U of T's reputation as an environmentally responsible institution, attracting students, faculty and stakeholders.

5. Improve energy performance: U of T can achieve measurable energy performance enhancements by adhering to ISO 50001 guidelines.

6. Reduce energy costs: Through optimized energy use and efficiency improvements, U of T can lower its operational expenses.

7. Optimize existing assets: ISO 50001 enhances energy use efficiency by improving energy system management, including staff competence.

8. Promote awareness and behaviour change: Integrating energy efficiency into management practices raises awareness and encourages sustainable behaviors across the campus.

9. Seamless Integration with other management systems: ISO 50001 aligns with U of T's existing quality and environmental management systems, creating synergies and streamlining efforts.

Overall, ISO 50001 serves as a strategic step toward sustainable energy practices and contributes to U of T's commitment to environmental stewardship, and a model for sustainability and climate positivity in the academic community.

Policy, procurement and design standards

U of T is large and growing. The St. George campus has a large portfolio of existing buildings, many of which are heritage, and require significant retrofits to reduce energy use and GHG footprints. We also have many new buildings and major renovations planned over the next ten years. We will need to reduce our energy consumption in existing buildings and enforce our high-performance design standards in all buildings to ensure we meet our low-carbon goal. Through engagement programs, we will continue to interact with occupants to monitor and analyze operations and to safeguard conduct is in alignment with U of T's carbon reduction goals.

Design standards for capital projects

All capital projects, such as new buildings and renovations, are designed for superior performance in energy, carbon, and water usage. In 2020, the tri-campus energy modelling and utility performance standard was published to set energy and carbon budgets and ensure high-performance construction in all capital projects. In the standard, the stringency of energy and carbon targets increases incrementally based on the year of occupancy of each project. The standard is estimated to reduce carbon emissions on campus by around 1,300 tonnes of CO2e per year compared to local and provincial minimum code requirements.

Environmental standards and procurement

In 2023, we evaluated and identified industry-standard requirements relevant to U of T, formed a tri-campus multi-disciplinary standards development team, and produced a draft sustainable building design standard. We are now consulting stakeholders and revising the standard to publish in late 2024. We are also in the process of developing a sustainable procurement guideline policy with staff, vendors and faculty to ensure energy efficiency in new equipment (e.g., appliances, generators etc.) which, where possible, are furnished with smart features that will display, track and measure use and performance.

Living labs & experiential learning programs

Students and faculty apply skills in teaching and research to real-world operational settings through coursework, collaborations with research teams and programs like the Campus as a Living Lab and Work Study. These opportunities facilitate the development of hands-on skills, which are crucial for the creation of the next generation of leaders and problem solvers tackling climate change. The Operations team has the privilege of leveraging U of T's talent to adopt innovative carbon reduction and capture technologies as well as collect, measure and analyze results. We will encourage and facilitate the integration of students and faculty within Operations in developing tomorrow's solutions. For example, our research-intensive university has many laboratory fume hoods that exhaust large amounts of energy as conditioned air. With more than 1,200 fume hoods in labs across our campuses, we have the opportunity to improve fume hood use to save energy, improve safety and reduce GHGs. In collaboration with the Environmental Health & Safety department, we have developed a unique way to test and certify fume hood operation, resulting in energy savings and, therefore, GHG reductions while maintaining a high level of safety. This collaboration will be continued, and safe, energy savings at fume hoods will be pursued across campus.

Behavioural measures

The Sustainability Office will develop and implement a building occupant engagement program aimed at staff, students, and faculty. The program will aim to:

1. Increase awareness about building features, environmental standards and efforts by the university to help build an identity and culture around energy conservation on campus;
2. Educate about conservation actions and habits at the user level, such as turning off the lights, shutting the sash, and avoiding phantom power;
3. Develop occupant guidelines and metrics in consultation with staff, students and faculty;
4. Further identify and empower champions; and
5. Solicit energy-saving ideas.

The Sustainability Office will work with residence life coordinators and other groups on campus, like the Green Chemistry Initiative, to help disseminate information and scale targeted programming. The energy conservation and demand management plan will be shared with divisional representatives to allow an open and transparent approach and to ensure

inclusivity in the planning and application of the energy conservation project.

For more information, please contact:

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