



Conservation and Demand Management Plan

2024-2029

Introduction

Ontario Regulation 25/23 under the Electricity Act 1998 requires public agencies—municipalities, municipal service boards, school boards, universities, colleges and hospitals—to report on their energy consumption and greenhouse gas (GHG) emissions annually and to update energy Conservation and Demand Management (CDM) plans every 5 years starting in 2019.

Sections

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2 - Current and Proposed Measures

3 - Renewable Energy Generation

4 - Confirmation of Approval by Senior Management

Appendices

Section 1: Results

Annual Energy Consumption 2023

Please refer to:

Appendix A

2023 Reg. 397/11 Campus Data

Appendix B

Queen's Carbon Footprint Report

Energy Conservation Goals

Energy use and emissions reductions at Queen's are planned around three pillars:

- 1) New buildings to be energy efficient
 - Targeting LEED Gold including high performance envelopes to reduce heat loss
 - Heating systems to be geothermal or other similar efficient non-emitting equipment
- 2) Existing buildings to be recommissioned and retrofitted
 - Recommissioning involves reviewing and optimizing controls, and repairing malfunctioning or poorly performing systems to bring buildings back to their highest possible performance
 - Retrofitting replaces existing systems as they reach end of life with modern efficient low or no emissions equipment
- 3) Central steam system to be converted to efficient district energy
 - Replacement of the central natural gas fired steam system with a non-emitting alternative

Results

The most significant outcome during the previous CDM plan was the successful achievement of a 35% reduction of Carbon emissions by 2020 as laid out in our [Climate Action Plan](#). The university now turns its attention to 2030 targets and continued electricity, water, and natural gas demand management.

During the period covered by the second CDM plan (2019-2024) Queen's was able to keep total energy costs relatively stable despite increasing enrollment and a significant increase in square footage. Cost control was achieved through a combination of energy conservation projects, behavioural measures, and strategic energy procurement.

Electrical peak demand shaving has been the cornerstone of utility cost control. Over the last 2 years a new demand management system has been developed with our building controls providers to allow our controls staff to pre-plan and execute electrical load reductions by making small, typically unnoticeable, changes to building temperature setpoints. This peak response contributes to GHG emissions reductions at the grid level by reducing load on GHG intensive generation such as natural gas peaking plants.

Projects

Since 2019 several million dollars have been invested in conservation projects. Of the 8 technical measures proposed in the 2019 CDM plan, 4 have already been implemented or are in progress, as well as several other projects developed in the

interim. Below is a list of some of the measures implemented from 2019-2024.

Building Standards

Updates to the Queen's Building Standards are creating a built environment with significantly lower emissions than existing building stock. All new builds are now required to be geothermal or an equivalent emissions-free efficient system. A strict Thermal Energy Demand Intensity target means buildings must be designed to be well insulated and airtight, with heat recovery on ventilation. Already the former St Mary's of the Lake Hospital has been converted to geothermal as part of a whole building renewal, and the Agnes Etherington art gallery and CASTLE lab geothermal projects are under construction.

Electricity Conservation Projects

Electricity conservation projects are continuous and ongoing. As of July 2024 approximately 5,000 fluorescent fixtures have been replaced as part of a campuswide program, with 2,700 more to be replaced by the end of 2025. Building automation systems have been upgraded with new panels that allow central access to real time status using graphical displays. A new demand management system was implemented on both building automation system platforms covering 19 large buildings that allows for peak shaving during periods of high provincial demand.

Queen's has partnered with the IESO as participants in the provincial Strategic Energy Management Program.

Water Conservation Projects

Installation of real-time water metering in Chernoff Hall and the Queen's Centre has allowed for monitoring of water use to more quickly identify and correct water loss issues at the pool and large cooling systems in those buildings. Replacement of high-flow fixtures such as cistern urinals is ongoing. Replacement of the liquid-ring vacuum pump at Dupuis hall has saved over 23,000 m³ of water per year.

Natural Gas Conservation Projects

In cold climates buildings require a great deal of natural gas fired steam heating through much of the year. Reducing building exhaust flows also reduces the required outdoor make-up air and heating a building needs. In Chernoff Hall upgrades to the fume hood controls including occupancy sensors, have allowed us to modulate ventilation rates to match only what is needed, saving approximately 1 GWh annually. New ventilation exhaust controls have also been added to the kitchen exhaust hoods in 1 of the 2 main dining halls. The kitchen exhaust now ramps down overnight and sensors within each of the cooking hoods control dampers and a VFD on the fan to match the exhaust flow to the requirement. Savings have not been quantified for this project but are expected to be significant.

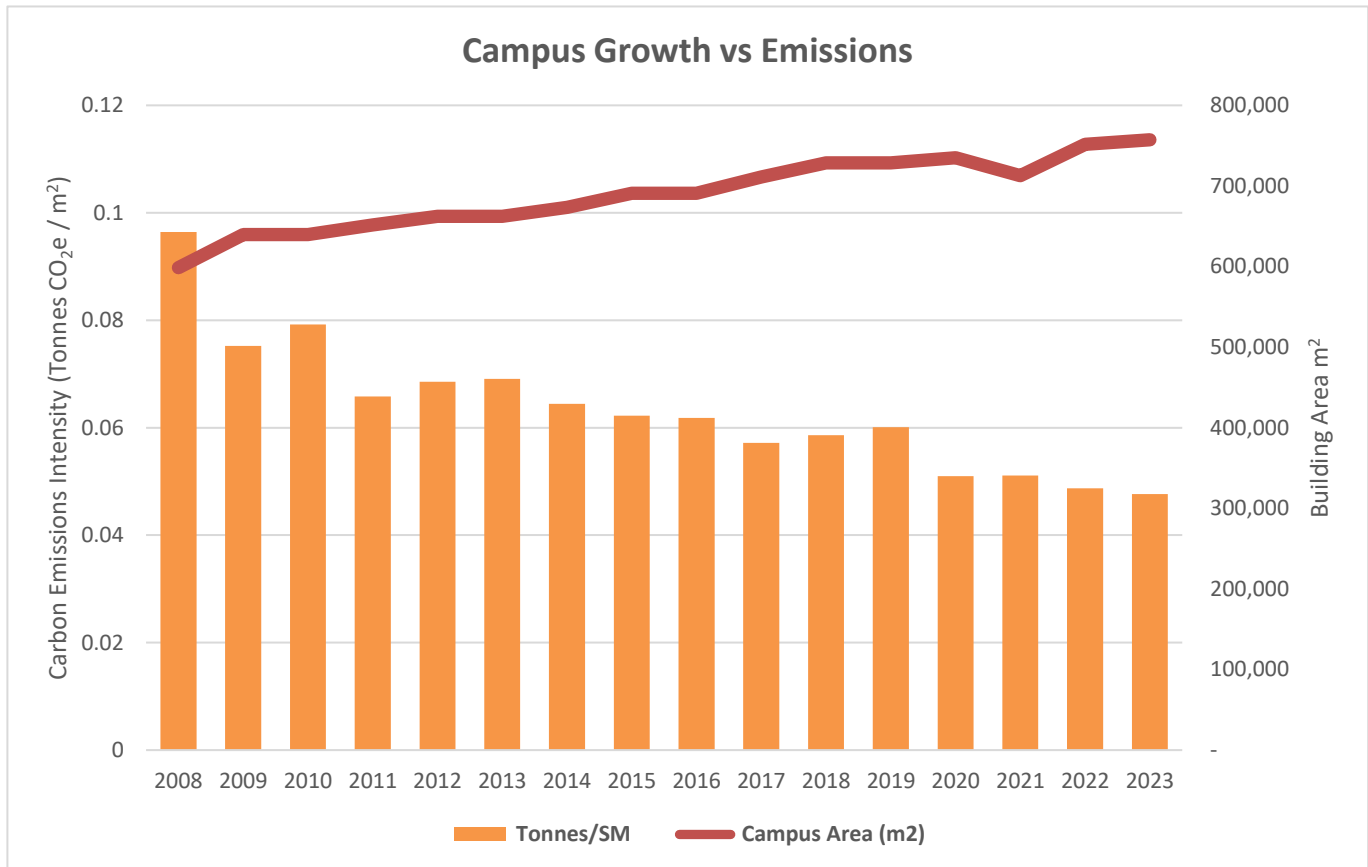
Heat recovery wheels have been optimized or repaired in Watts Hall, Mitchell Hall, the Queen's Centre, and the School of Medicine. These high-efficiency heat recovery devices capture up to 80% of the heat from the exhaust air and pass it off to the incoming air stream.

At the LaSalle building the ventilation system is being converted after a change in occupancy type. At one time this building housed an animal care unit, requiring 100% fresh air ventilation. As it is now an administrative building the ductwork and controls are being modified to allow recirculation of a portion of the ventilation to reduce the make-up air requirement – while meeting ASHRAE codes and standards.

The natural gas fired electricity + steam cogeneration system housed within the Central Heating Plant is being managed to minimize run times, reducing natural gas consumption. This system is key to electrical grid demand management, operating on provincial peak days. Through careful iterative development of the peak shaving strategy the run hours of the cogeneration system have been reduced by approximately 50% compared to historic strategy.

Greenhouse Gas (GHG) Intensity Reduction

In February 2010, Principal Woolf signed the University and College Presidents' Climate Change Statement of Action for Canada. This pledge commits the university to engage in activities aimed at reducing GHG emissions and enhancing research and curriculum in the areas of climate change and sustainability. It also required the development of a comprehensive Climate Action Plan (CAP), which was published in March 2016 and set an institutional target of net-zero by 2040. Energy conservation projects have helped Queen's total greenhouse gas emissions per square meter (SM) decline year over year since 2013. As of 2020 Queen's had achieved the interim target of 35% reduction in greenhouse gas emissions from a 2008 baseline.



Section 2: Current and Proposed Measures

Through investments in energy conservation, and strategic energy procurement, Queen's has had success containing utility costs, seeing a relatively small increase in spending despite significant organizational growth and utility rate changes.

Proposed utility conservation measures and the business case to support them will be reviewed on a continuous basis by the Energy and Sustainability Team. Criteria for review and evaluation will be based on access to capital, significance of energy and cost savings, GHG impacts and technical feasibility.

Individual Technical measures

- District Energy Planning** - The next step toward achieving the goal of carbon neutrality by 2040 is a Campus District Energy Study. This work will form the foundation of future plans by gathering details on existing energy requirements across campus and potential alternatives to fossil fuels as the primary energy source on campus. This

study will be designed to address the campus as a whole and make recommendations particularly around the heating and cooling systems. In addition to this broad study there are several individual technical measures or sections of the campus that can be transitioned concurrently.

2. **Separate West Campus Domestic Hot Water** – The district heating system on West Campus currently provides high temperature hot water year round because the domestic hot water systems on West Campus are served by this heating water loop through heat exchangers in each building. Installing individual hot water systems in each building would allow the district loop to operate at a lower temperature, more efficiently, for most of the year.
 - Estimated Cost: \$400,000
 - Estimated Savings: 30% of annual operational cost, enables further savings in connected heating systems
 - Duration of project impact: Permanent

3. **Sewer Heat Recovery** – Heat recovered from wastewater lines that go past Queen’s Main and West campuses may be a viable option to heat nearby buildings in a district system and could be investigated further. Several projects at hospitals and universities in Ontario are moving forward now using this technology, a feasibility investigation could be undertaken to determine the energy, emissions, and financial impact of this measure.
 - Estimated Cost: \$2,000,000
 - Estimated Savings: \$200,000 / year
 - Duration of project impact: Permanent

4. **Continued Expansion of Real Time Utility Metering** – Networked meters which can be read in real time have been installed in a few test buildings to monitor steam condensate, water, and gas use. Additional meters would provide valuable data to enable energy and water conservation, including modelling of potential upgrade measures and rapid identification of leaks and mechanical issues.
 - Estimated Cost: \$500,000
 - Estimated Savings: Enabling measure, no direct savings but informs additional projects
 - Duration of project impact: Permanent

5. **Explore Renewable Energy Options** – While it is not possible to provide enough energy with on-site renewables on Queen’s campus, roof mounted solar generation could contribute potentially 5-10% of annual energy use. To achieve stated energy and emissions goals this could be an important measure to include in future plans. The Queen’s Building Standard has already been updated to encourage new builds to have roofs designed for the addition of solar generation.
 - Estimated Cost: Dependent on scale
 - Estimated Savings: Potentially 5-10% of total campus energy consumption
 - Duration of project impact: Permanent

6. **Building Retrocommissioning** – Optimization of existing building automation, controls, HVAC balancing and scheduling functions, repairs to valves that can result in simultaneous unintended heating and cooling. Through their lifecycle buildings undergo renovations, and changes in their occupancy. The functionality of equipment can be

compromised and schedules and operating parameters no longer reflect actual facility use and layout. Retrocommissioning is a process to correct these deviations from optimal building performance without wholesale capital replacement of systems.

- Estimated Cost: \$5,000,000
- Estimated Savings: \$3,000,000 /year
- Duration of project impact: 5 year cycle

7. **Local District Energy Study at West Campus, KCVI, or east Main Campus** – While an overall District Energy Study is required to create the groundwork for the replacement of the central steam system with a fossil fuel free alternative, some areas on the periphery could be converted on their own in advance of this larger work. The West Campus hot water heating loop could be switched from a natural gas boiler to a clean alternative. A district green energy system could be installed in the KCVI-Goodes Hall-Stauffer block. The biomedical labs buildings along the east side of campus are another potential zone to be put on an alternative district system.

- Estimated Cost: \$800,000
- Estimated Savings: Enabling measure
- Duration of project impact: Permanent

Organizational Measures:

1. **Lifecycle Costing Capital Projects** – Expand current process of lifecycle costing to all energy intensive equipment and systems to ensure energy and water efficiency are primary drivers of equipment selection and design for all major construction and renovation capital projects. Forging the link between operational and capital budgets can help ensure integral components are excluded from value engineering efforts.
2. **Continuous Building Standard Energy Efficiency Updates** – Reducing overall energy consumption and emissions requires that new builds do not add to the problem. Continuous improvement of the building standard driving toward net zero energy and emissions buildings can enable the achievement of this goal. Other measures such as ensuring new lab buildings have year round process cooling available throughout research space can help make buildings future-proof and eliminate the need for inefficient add-on cooling systems.
3. **Establish a Cross Campus Energy Conservation Network** – Energy and emissions are becoming a priority at the departmental level. The library system and residences facilities managers are now working with Queen’s Facilities directly on reducing their emissions, and energy use. Plans have been made to expand this energy conservation network to managers of lab buildings, athletics, and academic faculties.
4. **Benchmarking Building Performance with Natural Resources Canada RETScreen Expert Software** – Use weather adjusted building utility benchmarking to identify and improve buildings with poor performance using RETScreen Expert software.

Note: Cost and savings estimates are rough preliminary estimates, additional analysis is required to determine actual values.

Section 3: Renewable Energy Generation

Development of Distributed Renewable Energy Systems

Installed Systems

- Goodwin Hall – 20KW Solar system, wall mounted to provided additional solar shading of office windows
- Walter Light – Queen’s ePower Lab - 18 kW solar and 2 kW wind, for research and power generation

Planned Measures

- On-going investigation of potential sites for additional renewable energy systems
- Incentive system for departmental level investment in renewables

Heat Pumps for New Construction

At the former St Mary’s of the Lake Hospital site, a whole building renewal was completed including a geothermal heating system of 36 boreholes. Additional geothermal systems are designed and ready to break ground as part of the Agnes Reimagined art gallery renewal project, and the new Climate Adaptive infraStructure Testing and Longevity Evaluation (CASTLE) lab.

New builds will use geothermal and/or air source heat pump technology as an alternative to fossil fuel based heating.

Section 4: Confirmation of Approval by Senior Management

To: Ontario Minister of Energy

Queen’s University’s commitment to CDM will continue and this document will serve as a guide in that process over the next 5 years. The plan and details will be revised and updated to reflect opportunities and priorities for conservation and energy efficiency within the Universities operations.



John Witjes
Associate Vice-Principal, Facilities

Appendix A

| Ont. Reg. 507/18 Broader Public Sector Energy Consumption and Greenhouse Gas Emissions Reporting Data | | |
|--|--|-------------|
| Timeframe | Jan 2023 - Dec 2024 | |
| Sector | University | |
| Agency Sub-sector | Post-Secondary Educational Institution | |
| Organization Name | Queen's University | |
| Operation Name | Campus Total | |
| Operation Type | Classrooms and related facilities | |
| Address | 207 Stuart Street | |
| City | Kingston | |
| Postal Code | K7L 3N6 | |
| Total Floor Area | 8,151,283 | Square feet |
| Avg hrs/wk | 60 | |
| Electricity Quantity | 109,761,327 | kWh |
| Natural Gas Quantity | 642,808 | GJ |
| Fuel Oil 1 & 2 Quantity | 353 | Litre |
| Fuel Oil 4 & 6 Quantity | 0 | Litre |
| Propane Quantity | 682 | Litre |
| Coal Quantity | - | |
| Coal Unit | - | |
| Wood Quantity | - | |
| Wood Unit | - | |

Appendix B

(See next page)



SUSTAINABLE
Queen's
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Queen's
UNIVERSITY

Greenhouse Gas Inventory Report 2022

Compiled & Written by Queen's Facilities | Nov 2023

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SUMMARY

Queen's University in Kingston, Ontario is committed to advancing the United Nations Sustainable development Goals, and specifically to the University's role in addressing climate change. As a learning and research institution, Queen's has an opportunity to contribute to climate change issues, support the efforts of its innovators, and educate a future generation of decision makers.

In 2010, Queen's University signed the University and College Presidents' Climate Change Statement of Action for Canada, thereby committing to reduce greenhouse gas (GHG) emissions. As part of this agreement, Queen's is required to track and report all GHG emissions. This is the fourteenth annual Greenhouse Gas Inventory Report published, which contains a summary of Queen's Scope 1&2 emissions as calculated according to the World Resources Institute (WRI) GHG Protocol for Corporate Accounting standard.

In total, Queen's emitted 38,785 tCO₂e from January 1 to December 31, 2022 which is a slight increase from 2021.

The Queen's Climate Action Plan (CAP) was developed to reduce the GHG emissions emitted by the University, with a goal of being carbon neutral by 2040. Milestone targets for 2020 and 2030 have also been set to structure an achievable timeline for carbon neutrality. The CAP's target of 35% GHG reductions by 2020 was successfully met, and Queen's is now working towards the second milestone of 70% reduction by 2030. This report provides a breakdown of the university's emissions in 2022 as well as an overview of Queen's plan for further emission reduction.



BACKGROUND INFORMATION

Scope of Emissions

This report reviews the overall emissions associated with the operations of Queen’s University, including the direct (Scope 1) and indirect (Scope 2) emissions of all Queen’s facilities and operations within the province of Ontario. This encompasses leased and owned buildings both on and off campus. The report excludes any satellite offices outside of Ontario and the Bader International Study Centre at Herstmonceux, England.

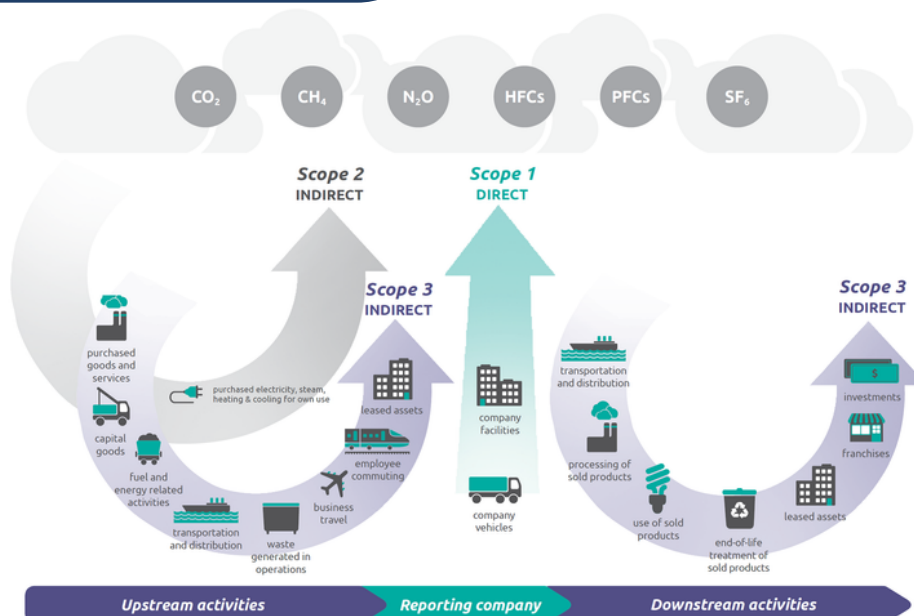
Scope 1 emissions include all emissions directly produced by the University, most of which are caused by local energy production to heat the campus. The main contributors to Scope 1 emissions include:

- Stationary combustion from the boilers, cogeneration plant, generators, furnaces, and kitchen equipment
- Mobile combustion from various fleet vehicles and grounds maintenance equipment
- Fugitive emissions from electrical switches, fire suppression equipment, lab chemicals, and refrigerants

Scope 2 emissions include all indirect emissions associated with energy that the University purchases, including:

- The University’s Main and West Campus electricity consumption
- The electricity consumption of Queen’s Biological Station (QUBS)
- The electricity, heating, and cooling in all leased spaces

Scope 3 emissions include all other indirect emissions, and are comprised of 15 unique categories, such as commuting and, that are not included in the scope of this report



Source: https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporting-Standard_041613_2.pdf

Method of Calculation



The quantification methods used to calculate GHG emissions for Queen's University in this report were developed according to the WRI GHG Protocol for Corporate Accounting standard.

All fuel combustion and electricity consumption has been determined from invoice records and utility metering. These sources account for approximately 96% of Queen's GHG footprint. The remaining 4% is calculated based on estimations of non-metered sources such as fugitive releases from laboratory chemicals, refrigerant leakage, wood combustion and small fuel-consuming equipment.

Using emission factors, which are unique to each emission source, the raw data has been converted to metric tonnes of CO₂ equivalent emissions (tCO₂e). This allows for normalized comparison between different types of emissions sources.

The emission factors used in the calculations are based on national industry standards that tend to remain static for most fuels, with the exception of electricity. The grid emission factor used for electricity calculations fluctuates year to year depending on the Ontario electricity grid supply mix, and is published annually in Environment Canada's National Inventory Report.

The data provided in this report was prepared by Queen's Facilities Energy & Sustainability Team. Any questions regarding the methods used to collect and calculate these values can be directed to sustain@queensu.ca.

2022 EMISSIONS OVERVIEW

Emissions Summary

Queen's University produced 35,612 tCO₂e Scope 1 and 3,173 tCO₂e Scope 2 emissions throughout 2022, summing to a total carbon footprint of 38,785 tCO₂e. To determine Queen's net carbon footprint, the portion of emissions associated with energy exported off-site to Kingston General Hospital (KGH) was excluded.

Over three quarters of Scope 1 emissions on campus come from the Central Heating Plant (CHP) which is owned and operated by Queen's. The CHP produces steam with natural gas boilers for heating buildings, and intermittently produces electricity and steam with cogeneration turbines. In addition to serving Queen's Campus, the CHP also generates electricity and steam for KGH.

The total emissions produced by Queen's including exports to KGH in 2022 was 47,299 tCO₂e. KGH demand from the plant was responsible for approximately 20% of that total, so that portion is removed from Queen's Scope 1 emissions. A summary of Queen's emissions is shown below in Table 1, including emissions normalized by population and area.

tCO₂e is a metric tonne of carbon dioxide equivalents. This is a universal unit of measure that indicates the global warming potential (GWP) of each of the six greenhouse gases (CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆) expressed in terms of the GWP of one unit of carbon dioxide. This enables the normalized summation of emissions from all GHGs).

| | Queen's Emissions (tCO ₂ e) |
|------------------------------------|--|
| Scope 1 | 35,612 |
| Scope 2 | 3,173 |
| Total | 38,785 |
| Per Capita | 1.08 |
| Per 100 m ² Floor Space | 5.02 |

Table 1: Summary of Queen's University's 2022 Scope 1 & 2 carbon emissions

Emissions Breakdown by Scope

Scope 1 Emissions

Scope 1 emissions are those emitted on site due primarily to energy generation and unintentional chemical release. A source by source breakdown of Queen's Scope 1 emissions is shown in Table 2. The greatest contributors to these emissions are the Central Heating Plant (CHP), which uses natural gas powered boilers to heat the campus in the winter, and stand alone heat generation in buildings that are not connected to the CHP. The remaining emissions are created by fuel combustion from the campus vehicle fleet, laboratory chemicals, and wood combustion.

| Scope 1 GHG Sources | Total Emissions (tCO2e) |
|------------------------------|-------------------------|
| Net CHP Emissions | 27,386 |
| Heat Generation in Buildings | 6,440 |
| Refrigerant Leakage | 1,502 |
| Fuel Combustion in Equipment | 244 |
| Laboratory Chemicals | 23 |
| SF6 Leakage | 16 |
| Wood Combustion | 2 |
| Scope 1 Total | 35,612 |

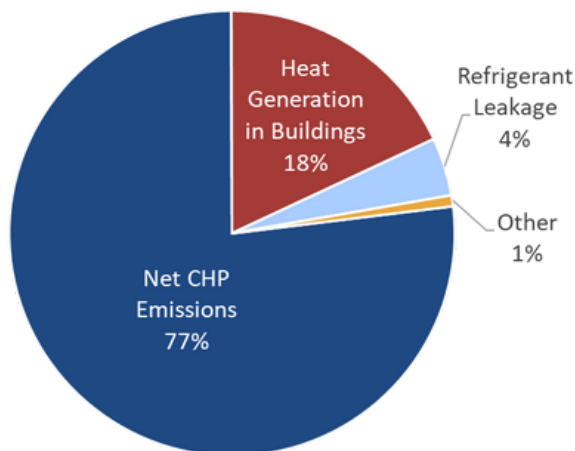


Table 2: Queen's Scope 1 emission source breakdown

| Scope 2 GHG Sources | Total Emissions (tCO2e) |
|-----------------------------------|-------------------------|
| Owned Buildings Grid Electricity | 2,994 |
| Leased Buildings Heating | 82 |
| Leased Buildings Grid Electricity | 80 |
| Leased Buildings Cooling | 18 |
| Scope 2 Total | 3,173 |

Scope 2 Emissions

Scope 2 emissions are indirectly produced by the University through electricity usage in Queen's owned and leased buildings. A source by source breakdown of Queen's Scope 2 emissions is shown in Table 3.

The quantity of emissions produced by a kWh of electricity from the grid is calculated as an annual grid emissions factor, representing an average based on all forms of electricity production contributing to the provincial grid.

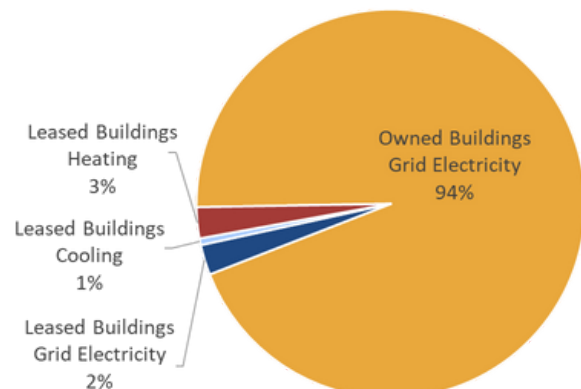


Table 3: Queen's Scope 2 emission source breakdown

Emissions Over Time

From 2008 to 2022, Queen's has reduced its total GHG emissions from 57,716 tCO₂e to 38,785 tCO₂e. Figure 1 shows a year over year breakdown of Queen's total Scope 1 & 2 emissions. In 2020, the University was successful in reaching its goal of 35% emissions reduction from the 2008 baseline. In 2022, Queen's emissions rose slightly. This increase can be attributed to the addition of the new 334-bed student residence, as well as increased ventilation and reduced recirculation in all campus buildings as students returned to classes following the COVID-19 pandemic shutdown. When COVID-19 ventilation measures are lifted, Queen's is expected to shed the additional emissions that come with these safety procedures.

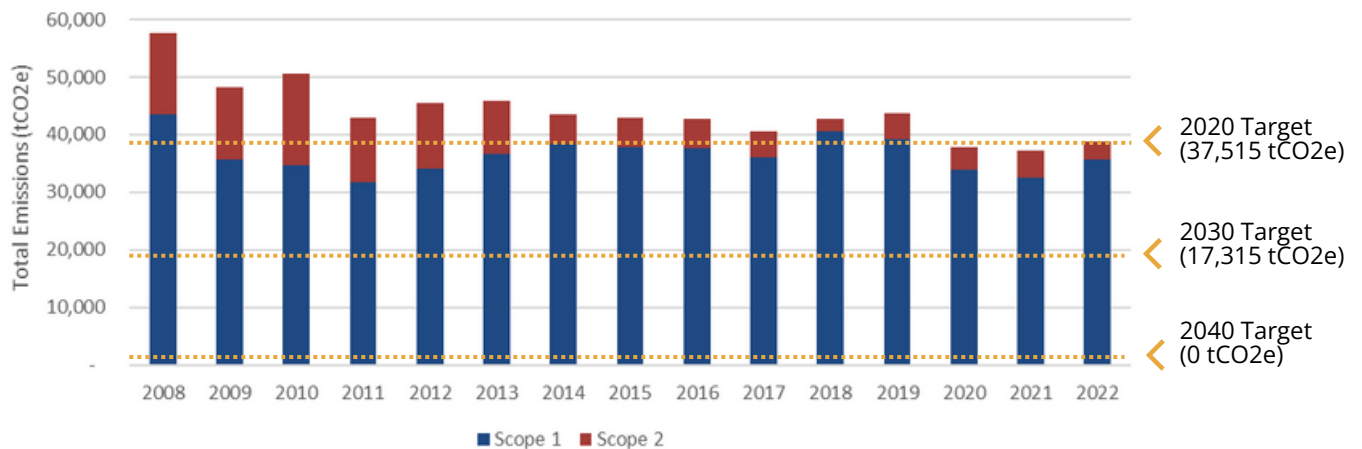


Figure 1: Queen's year over year Scope 1 & 2 GHG emissions and emission targets set in 2010

While Queen's observed an increase in total emissions in 2022, the University also experienced a decrease in emissions per unit of building floor space. As shown in Figure 2, there was a decrease from 5.22 tCO₂e/100 m² to 5.02 tCO₂e/100 m² from 2021 to 2022, indicating an overall improvement in energy efficiency. Even with significant campus and student growth, overall emissions have still been trending downwards, resulting in a 47.9% reduction in emissions per building area since 2008.

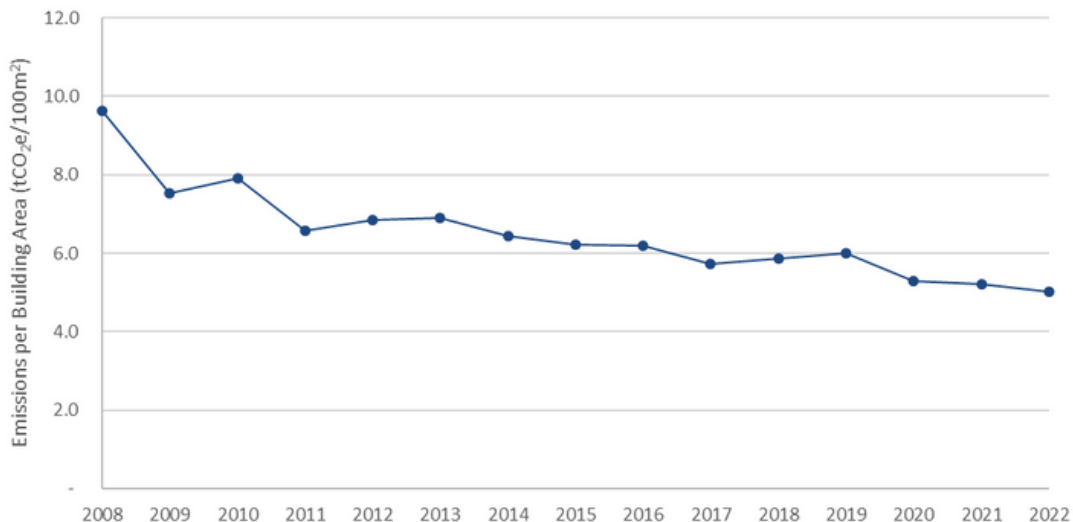


Figure 2: Queen's year over year total GHG Emissions per 100 m² of campus building floor space

QUEEN'S CLIMATE ACTION PLAN

Outline

Queen's Climate Action Plan was established in 2016 to align with the goals set out by the University and College Presidents' Climate Change Statement of Action for Canada, signed in 2010. The three areas of focus for the original plan included reduction of point-of-use consumption, improving efficiency and fuels at the CHP, and actualizing the use of renewable energy generation. Queen's reached the goal of achieving a 35% reduction in emissions by 2020. Table 4 outlines the targets set in the Climate Action Plan.

| Year | Target Emission Reduction | Actual Emission Reduction |
|------|---------------------------|---------------------------|
| 2020 | 35% | 35% |
| 2030 | 70% | TBD |
| 2040 | 100% | TBD |

Table 4: Emission reduction target milestones

Some projects have already significantly reduced Queen's emissions, including the West Campus energy project which severed the steam line to West Campus eliminating heat losses along the 2.5 km path. Installing a new hot water distribution system on West Campus allowed Queen's to save 1,500 tCO₂e annually from the decommissioning of that steam line. Absorption chillers at KGH also reduce waste heat during the summer by using excess steam from the cogeneration units to chill water.

To continue improving the energy efficiency of Queen's buildings, there are multiple projects and policies that have been implemented. Updates to the Queen's Building Standard provide guidelines to ensure sustainability is considered for new projects and builds, eliminating fossil fuels from new designs, requiring efficient building envelopes, and heat recovery in ventilation systems. All new buildings are required to be Leadership in Energy and Environmental Design (LEED) Gold.

As noted in the Climate Action plan, updating the district steam system will be a focus to reduce emissions as heating on campus, both from the CHP and other natural gas boilers currently makes up 87.2% of all emissions.

Given the age and history of many buildings at Queen's, retrofitting and improving building envelopes and mechanical systems will be important to reducing carbon emissions. Minimizing load will help enable electrification, as well as lower cost of conversion to geothermal heating by reducing the required size of the system. Upgrading building controls, including scheduling and occupancy-based HVAC will be a primary focus moving forward to reduce energy consumption and cost - the most economical energy is the energy you do not use.

Emission Reduction Strategies

Queen's has eliminated over a third of its emissions since 2008 through a variety of clean energy projects and building upgrades. With parts of the main campus dating back as far as the mid 1800's, many of the buildings have benefitted from envelope renovations such as improved insulation and windows, as well as occupancy based controls for lighting and ventilation. Some of Queen's recent and upcoming carbon reducing projects are listed below.



355 King Administrative Building Geothermal System - 2022

In 2022 the Facilities team and several other administrative departments moved into a renovated space at 355 King St. This former hospital site, with some sections dating to the late 1800's, underwent a comprehensive renewal that included a geothermal system. Using electrically powered geothermal heating and cooling reduces reliance on greenhouse gas fired heating systems such as natural gas boilers. In addition to these operational emissions savings, thousands of tonnes of embodied emissions related to the construction and materials were also avoided by keeping the structure of the building.

Strategic Lab Revitalization - 2022

In 2022 a major upgrade to lab ventilation in Chernoff Hall was completed which is expected to reduce emissions by 780 tCO₂e/year. This project adds occupancy sensors connected to the building automation system to match airflow to required ventilation based on lab occupancy. By managing exhaust according to need, the amount of fresh outdoor make-up air that must be heated or cooled as it is brought into the building is reduced, saving energy and emissions.

Demand Controlled Kitchen Ventilation - 2023

In cold climates commercial kitchen ventilation systems use a significant amount of energy to heat the make-up air that replaces the kitchen exhaust. In 2023 the ventilation in the Leonard Hall kitchen is being upgraded to add a demand controlled system. Instead of running at full speed throughout opening hours, the system will use sensors to determine the amount of ventilation required, and vary the fan speed based on actual need. This project is expected to reduce emissions by 200 tCO₂e/year.

Replacement of 8,000 Fluorescent Fixtures with LED - 2022 to 2025

Over a 4 year period a major project to upgrade 8,000 fluorescent fixtures to energy efficient LED is happening in 20 buildings across campus. The resulting electricity savings will reduce Queen's Scope 2 emissions by an amount that will vary depending on the annual Ontario grid emissions factor.



FINAL REMARKS

Queen's University was ranked 3rd in the world and 1st in North America for the 2023 Times Higher Education report on the United Nations Sustainable Development Goals (SDG's).

The results of the carbon reductions over the last 14 years combined with our SDG results showcase the university's commitment to an ongoing strategic approach to sustainability across a diverse range of the SDGs. For more information on the university's strategic plans, please visit the Principal website.

www.queensu.ca/principal/