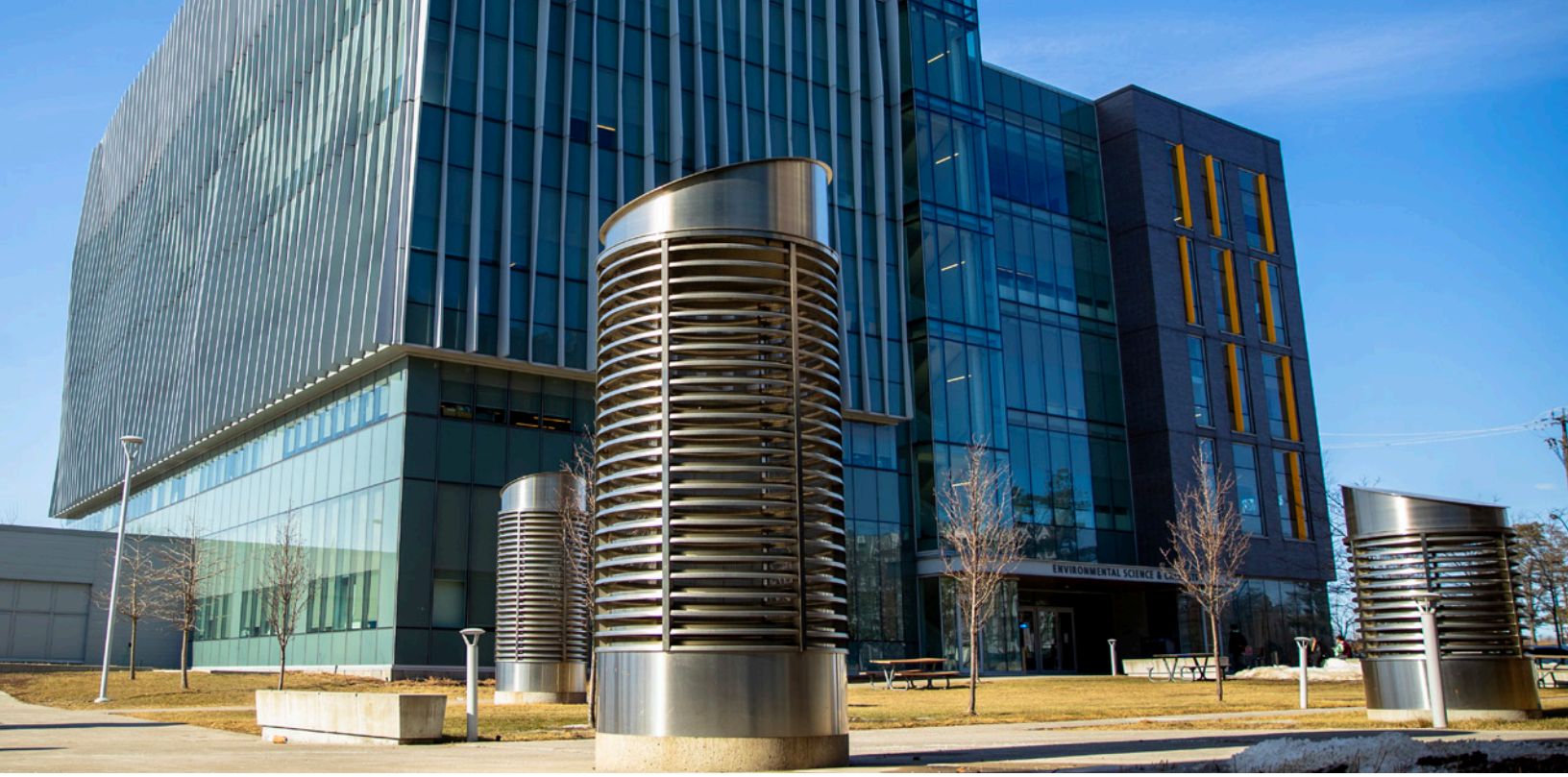

CASE STUDY

University of Toronto
Scarborough Campus

Decarbonizing campus with simple but impactful strategies

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Introduction

The University of Toronto published its Tri-Campus Climate Positive Commitment in 2023:

> To expand the climate positive goal across our entire institution, all three of our campuses pledge to achieve a climate positive operating model by 2050. This is an extension of our [...] commitment to reduce our GHG emissions by 37% relative to 1990 levels by 2030."*

The University of Toronto Scarborough Campus (UTSC) has made significant strides in sustainability efforts, positioning itself as a key player in promoting sustainability both in Canada and across North America. In its commitment to achieving carbon neutrality by 2050, UTSC has long partnered with Siemens for a variety of building automation, energy efficiency, and other facility measures.

A recent existing building commissioning (EBCx) project at the UTSC's Environmental Science and Chemistry Building (ESCB) demonstrates how thoughtful, simple improvements can drive significant decarbonization; this project in particular underscores how focusing on efficiency optimizations in existing buildings does not necessarily require expensive, complex solutions.

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What is a geo-exchange system?
A geo-exchange system uses a heat pump to harness the stable temperature of the ground to heat and cool buildings efficiently. It transfers heat from the building into the ground during summer and draws heat from the ground in winter, reducing both carbon emissions and dependence on traditional fuel sources.

Optimizing the ESCB's geo-exchange system

As a LEED Gold-certified building, the ESCB incorporates a geo-exchange system used for heating and cooling. But inefficiencies in the system's heat recovery chiller meant that natural gas consumption was significantly higher than anticipated, particularly during colder months. This posed a challenge to UTSC's decarbonization goals.

"Mechanical systems can be complicated," says Johnny Ravindran, UTSC's Manager of Energy Management and Implementation. "In this case, one piece of equipment – the heat recovery chiller – wasn't working as intended, and that had a cascading effect on the entire system's efficiency."

Beyond addressing the geo-exchange system, UTSC needed to tackle broader challenges associated with recommissioning an occupied, operational building where classes would continue to take place. "Retrofitting existing facilities is always more complex," Ravindran explains. "We're dealing with legacy systems and infrastructure, yet need to maintain comfort and functionality for students, faculty, and staff. Still, we can tackle the larger goal of decarbonization by taking on smaller projects with big impact."

How Existing Building Commissioning (EBCx) from Siemens supports UTSC

UTSC partnered with Siemens to optimize the ESCB with support from both the Independent Electricity System Operator's (IESO) SaveOnEnergy program and Enbridge Gas. This collaborative approach to EBCx involved data-driven problem-solving while also taking advantage of the province's available resources and incentives for reducing energy consumption.

"The first step was digging into the numbers," Ravindran shares. "Siemens engineers came in, analyzed our systems and data, and worked closely with our team to understand what was happening. They didn't just jump to conclusions. Instead, they did a deep dive into the building's operations, identifying where things had deviated from the original design and where we could make impactful changes."

Through this iterative process, UTSC and Siemens identified and addressed key inefficiencies:

- Recommissioning the heat recovery chiller to function as designed, ensuring it could reject heat into the building effectively
- Adjusting water loop setpoints to reduce overheating in the geo-exchange field

Other corrective measures identified and implemented through this project included HVAC scheduling, chilled water optimization, and air-handling unit setpoint adjustments.

"These deliberate, thoughtful adjustments made our existing infrastructure work smarter, not harder. Siemens engineers provided detailed reports but also simplified the findings so we could work together on optimizing our systems while addressing comfort issues," Ravindran notes.

Simple changes result in a 33% reduction in natural gas consumption for the ESCB

The results were transformative. After the implementation of recommissioning measures, it was originally expected that the electricity consumption would increase by 2% as heat recovery chillers were relied upon to provide heat to the buildings. However, through the systematic recommissioning process and the utilization of advanced control strategies, a reduction of 4% in electricity consumption was achieved. Furthermore, as a result of fuel switching, a significant decrease of 33% in natural gas consumption was observed.

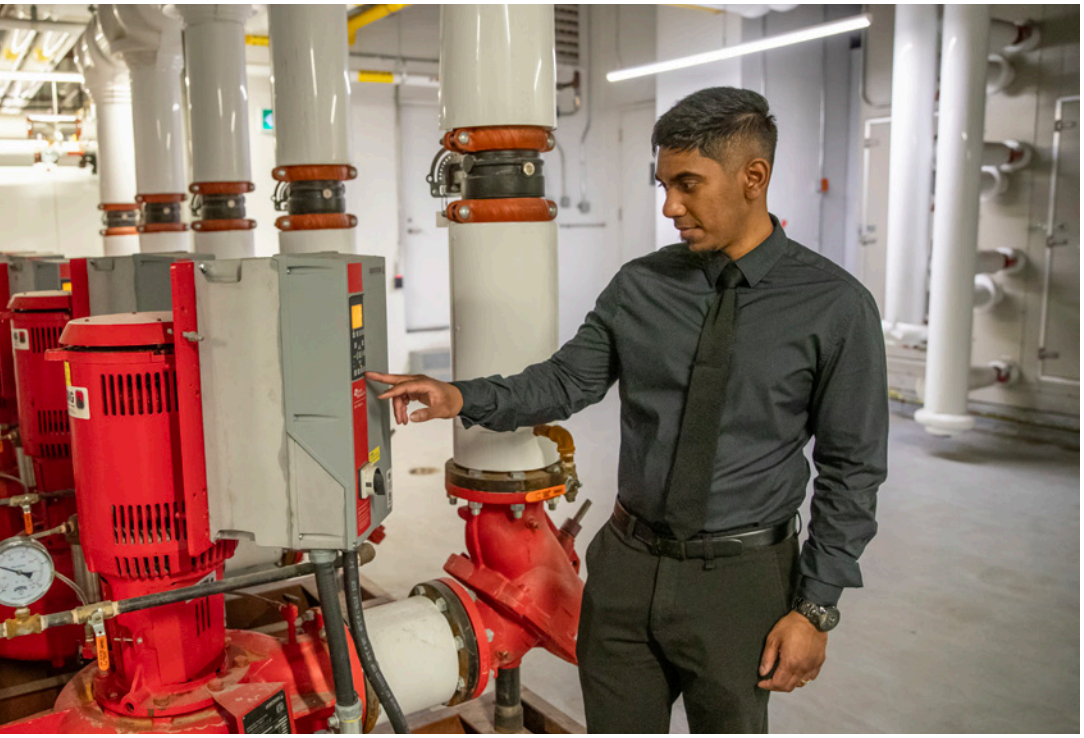
Since the project completed, the ESCB has achieved:

- **33%** reduction in natural gas consumption
- **4%** reduction in electricity usage
- **Annual GHG savings of more than 1,094 tonnes CO_2e**

"The best part is," Ravindran says, "these are tangible savings that can now fund future projects, creating a cycle for continued decarbonization efforts."

This cycle, combined with Ravindran's "small bites" philosophy, is especially important in older, existing buildings that were not necessarily constructed for energy efficiency. He says, "When these legacy buildings went up, energy costs were relatively low, and considerations for energy efficiency were not a primary focus. When you're working on a capital project and constructing new buildings, however, it's much easier to incorporate all these new innovative technologies that support our goals."

Ravindran also notes that UTSC has received utility incentives thanks to this EBCx project, which is generating even more support from campus leadership. "Programs like SaveOnEnergy and the support we receive from Enbridge Gas help make these initiatives financially viable. When we combine cost savings with environmental impact, the case for action becomes undeniable."



"When people think about decarbonization, they think of solar panels, electrification, and all these big-ticket items, and they certainly play an important role. But what's often dismissed is the first action: making your existing equipment operate as efficiently as possible."

Johnny Ravindran
UTSC's Manager of Energy Management and Implementation

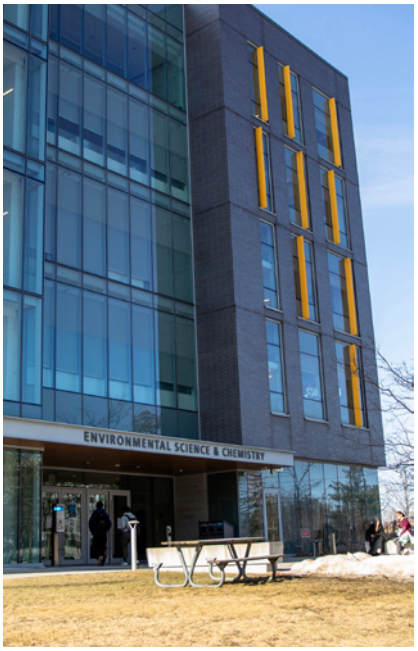
Looking ahead

UTSC's success sends a powerful message: starting a decarbonization journey doesn't require expensive new systems and capital investments. Instead, focusing on optimizing existing infrastructure can yield significant results.

The collaboration between Siemens and UTSC was key to success. "The Siemens team wasn't just interested in fixing things – they wanted to help us build something sustainable for the long term," according to Ravindran.

The project also reinforced the value of maintaining comfort in these existing, operating buildings while achieving energy savings. "It's a common misconception to think that reducing energy consumption means sacrificing comfort, but we've proven that's not true," Ravindran said.

UTSC is expanding its recommissioning efforts to other areas of campus beyond the ESCB to continue its journey toward Net Zero – setting an example for higher education institutions across Canada. "Our work here isn't just for us," Ravindran says. "It's good for the students, and when we showcase the good work we're doing, it makes them proud to be here."



All images courtesy of Save On Energy™

*University of Toronto Scarborough's Energy Conservation and Demand Management Plan: 2024-2029 | link

Published by
Siemens Canada Limited
1577 North Service Road East
Oakville, ON L6H 0H6

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Printed in Canada

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