Partners in Project Green

A Program of Toronto and Region Conservation Authority

Energy Leaders Consortium: Decarbonization at the University of Toronto

September 30th, 2025

Land Acknowledgment

We respectfully acknowledge that we are situated on the Traditional Territories and Treaty Lands, in particular those of the Mississaugas of the Credit First Nation, as well as the Anishinaabe of the Williams Treaty First Nations, the Huron Wendat, the Haudenosaunee, and the Metis Nation.

As stewards of land and water resources within the Greater Toronto Region, Toronto and Region Conservation Authority appreciates and respects the history and diversity of the land and is grateful to have the opportunity to work and meet on this territory.

Truth and Reconciliation Day

- The National Day for Truth and Reconciliation honours the lost children, survivors of residential schools, families and communities.
- This is a day to reflect on the history and ongoing impacts of residential schools, and to honour survivors, their families, and communities.
- September 30 is also observed as Orange Shirt Day: Orange Shirt Society

Learning Resources and Guides

- National Day for Truth and Reconciliation - Canada.ca
- Truth and Reconciliation Commission of Canada - 94 Calls to Action
  Call to Action #92 specifically addresses actions for the corporate business sector.
- United Nations Declaration on the Rights of Indigenous Peoples Act (UNDRIP) Action Plan
- Business Reconciliation in Canada Guidebook

- Native-Land.ca
- Circles for Reconciliation
- EdgeoftheBush

Learn more:
Text 1-855-917-5263 with your City and Province to know whose traditional territory you're on.

TRC Day Events in Toronto

- 8th Indigenous Legacy Gathering – Nathan Phillips Square
  - https://www.councilfire.ca/indigenous-legacy-gathering-september-29-and-30-2025/
- Orange After Dark – Poetry Jazz Café
  - https://www.eventbrite.ca/e/orange-after-dark-an-orange-shirt-day-show-tickets-1619018751669
- Orange Shirt Day Commemoration – Bata Shoe Museum
  - https://batashoemuseum.ca/
- Indigenous Film Screening: The Stand – Toronto Public Library – Morningside Branch
- Indigenous Film Screening: Cold Journey – Revue Cinema

PPG Resources

- **Member 101: Reconciliation in Action**

  TELUS shares their journey of developing a 5-year Indigenous Reconciliation Action Plan (IRAP) and offers practical advice for organizations.

  Access the Recorded Session here: Reconciliation in Action with TELUS

- **PPG's Learning Module:** Understanding Our Connection to Water: An Anishinaabe Woman's Perspective

  Developed by Cambium Ingenious Professional Services, this module shares an Anishinaabe woman's perspective on the significance that Water holds.

Agenda

Time	Activity
9:30 am -10:00 am	Arrival, Registration, Networking
10:00 am -10:10 am	Introduction by PPG
10:10 am -10:55 am	**Presentation 1:** Project LEAP, University of Toronto
10:55 am -11:40 am	**Presentation 2:** Air Source Boilers, AIM HVAC
11:40 am -12:00 pm	Q&A/ Discussion/ Networking
12:00 pm -1:00 pm	Geoexchange Tour
1:00 pm	Departure

A Collaborative Space for All

Proposed Operative Values for ELC meetings:

1. Balance airtime to hear from as many voices as possible
2. Be curious and challenge our own assumptions and biases
3. Be open to building on each other's suggestions or taking the conversation in another direction

PPG Updates

Welcome to the ELC!

City of Toronto

Upcoming ELC Sessions & PPG Events

Date	Topic
October 2nd, 2025 10:00 am - 3:00 pm	**Guided Tour: TRCA's New Head Office** *Free tours of the head office building as part of the Toronto Climate Week*
October 23rd, 2025 1:00 pm - 2:30 pm	**ELC Roundtable and Site Visit:** Exploring Renewable Energy Applications With Resco Energy
November 20th, 2025 9:00 am - 12:00 pm	**ELC Site Visit:** Hydrogen-Powered Combined Heat and Power (CHP) System
December 11th, 2025 1:00 pm - 2:30 pm	**ELC Member Roundtable:** Year-End Roundtable with Polaris Transportation
January 26, 2026 8:30 am – 4:30 pm	**ELC Energy Hunt** *More details coming soon!*

Member 101: Circular Procurement

To kick off Circular Economy Month, we will be joined by Circular Innovation Council for a Circular Procurement 101 session. Learn more about how you can leverage a simple yet powerful circular procurement framework to deliver cost savings, embodied carbon reduction, local job creation and more.

Date: Wednesday, October 1, 2025
Time: 12-1pm EST
Location: Zoom

Contact charlotte.hung@trca.ca for more details!

Register here!

In Pursuit of Polystyrene: Preventing Foam Pollution in Lake Ontario Webinar

In partnership with the University of Toronto Trash Team, this webinar will discuss polystyrene pollution and address construction foam pollution at its source. Key findings from a project conducted in collaboration with local construction companies will also be discussed.

- **Date**: November 18th, 2025
- **Time:** 1:00pm-2:00pm
- **Location**: Online via Zoom

Register Here

University of Toronto

University of Toronto

Scott Hendershot

Senior Manager – Sustainability Office,
Facilities & Services, University of Toronto

Sherif Shakour

Senior Utilities Reduction Manager,
University of Toronto

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CLIMATE POSITIVE

Our Plan and Action

Presented by

Scott Hendershot
Sr. Manager – Sustainability Office

Sherif Shakour
Sr. Utilities Reduction Manager

Sep 30, 2025

DEFY GRAVITY

UNIVERSITY OF TORONTO

Ranked 1st in the world for sustainability

QS WORLD UNIVERSITY RANKINGS: SUSTAINABILITY (QS SUSTAINABILITY), 2024 & 2025

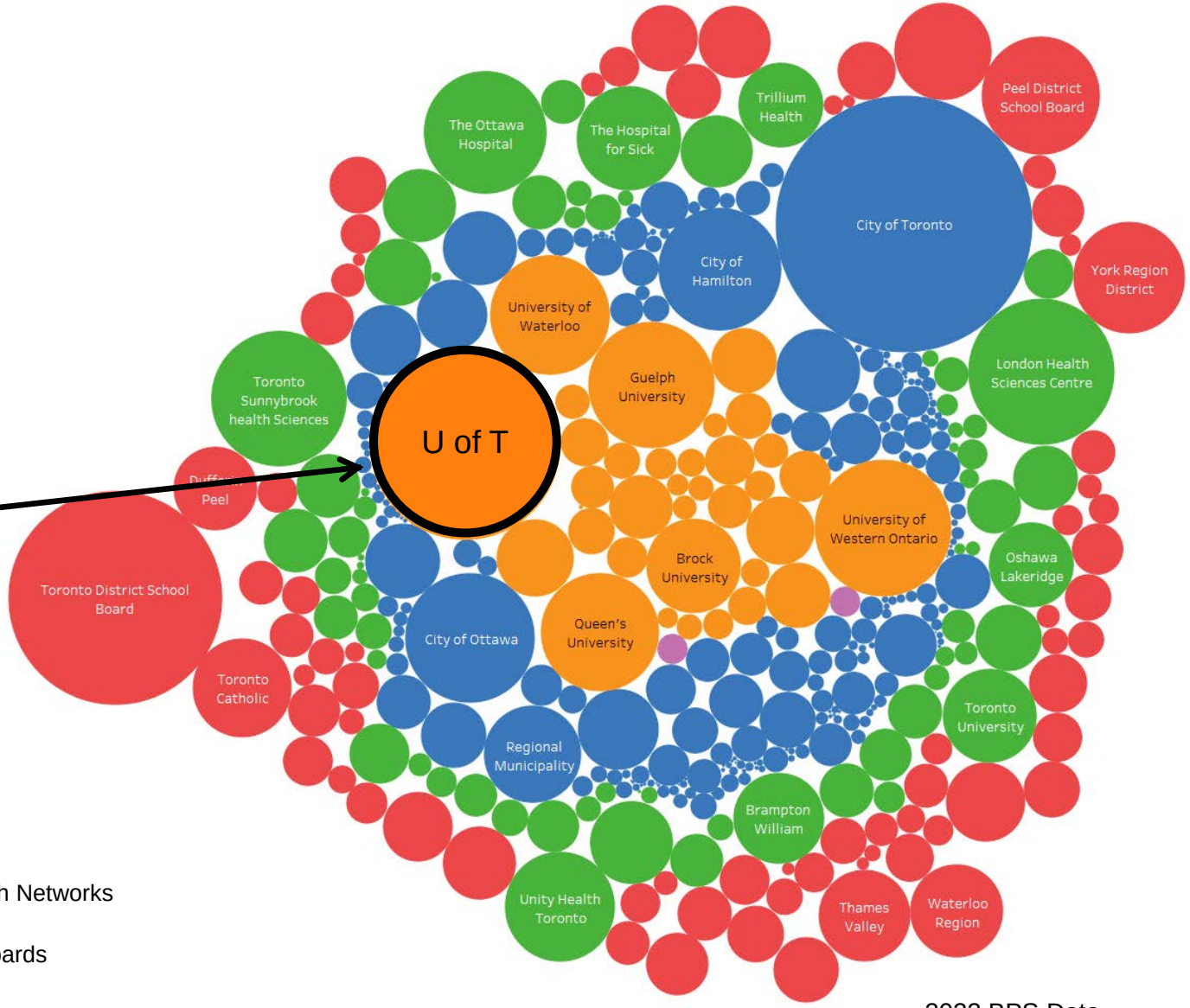
and…we're just getting started!


THE UNIVERSITY OF TORONTO
WILL BECOME CLIMATE POSITIVE BY 2050.
UNIVERSITY OF
TORONTO

HOW U OF T'S GREENHOUSE GAS FOOTPRINT COMPARES

U of T is the 3rd largest greenhouse gas emitter among institutions within Ontario's broader public sector:

1. City of Toronto
2. Toronto District School Board
3. University of Toronto



2022 BPS Data

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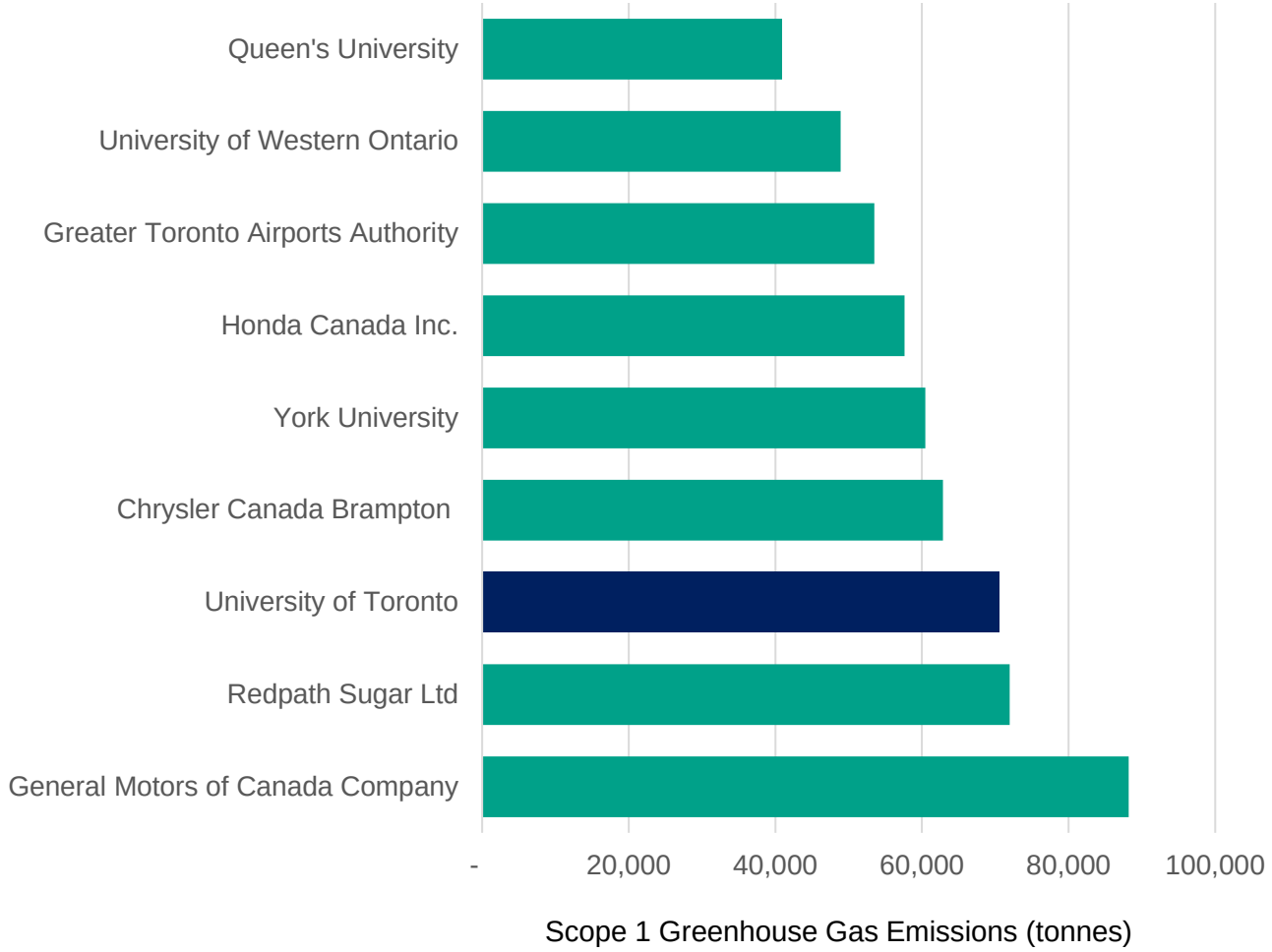
HOW U OF T'S GREENHOUSE GAS FOOTPRINT COMPARES

The St. George campus produces more greenhouse gas emissions than any other Ontario university & the entire provincial colleges sector

While we are efficient, we still have a significant footprint - comparable to many local auto manufacturing plants and other significant industry players



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Source: Canada's GHG Inventory 2023

CARBON REDUCTION FRAMEWORK: PRINCIPLES

Focus on Reduction First

Our strategy's primary focus should be reduction of the energy we consume

Balance Carbon with Cost

We could address our carbon issue by switching to electricity because **electricity is ~5 times cleaner than gas**, however electricity costs are approximately ~**10 times more expensive** on an equivalent energy basis

	Commodity Rate ($ / ekWh)	GHG Emissions (kg / ekWh)
Natural Gas	$0.015	0.1776 kg
Electricity	$0.158	0.0370 kg

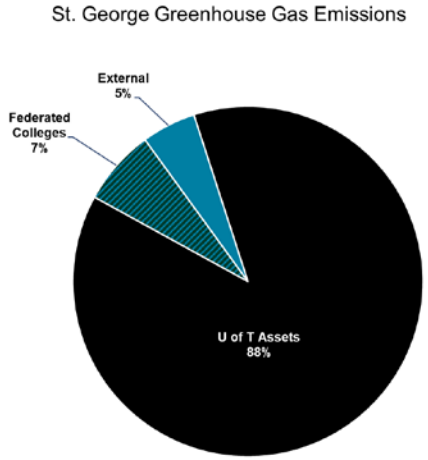
Note: 2022-2023 data

Reach Beyond Our Own Assets

On the St George Campus, approximately **12%** of our emissions come from assets we do not directly own or influence

Our carbon plan must incorporate reductions of these emissions

Partner with these organizations to reduce emissions



Fostering Innovative Solutions

Leverage the **Campus as a Living Lab** model to foster partnerships with our academic community to achieve carbon reductions

Develop external partnerships to **implement innovative solutions** to our carbon challenges

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OUR GOALS

1. Responsibly manage the growth of our campus to mitigate the environmental impacts of more space and activity

2. Renew existing and aged utility infrastructure to ensure future performance that supports academic and research excellence

3. Build resilient systems to support our carbon reduction targets with reliable infrastructure by changing how our campus produces, distributes, and consumes energy.

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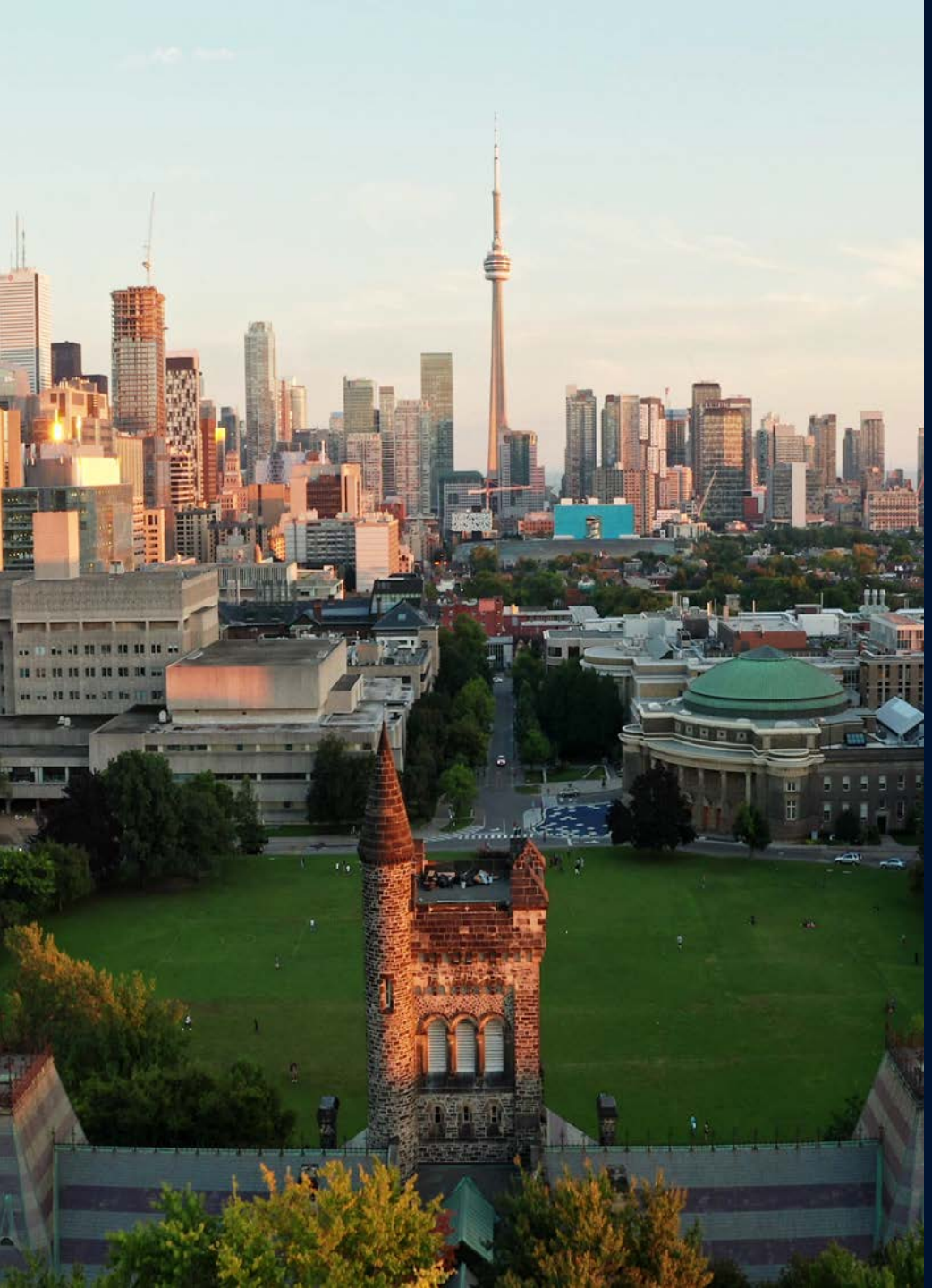
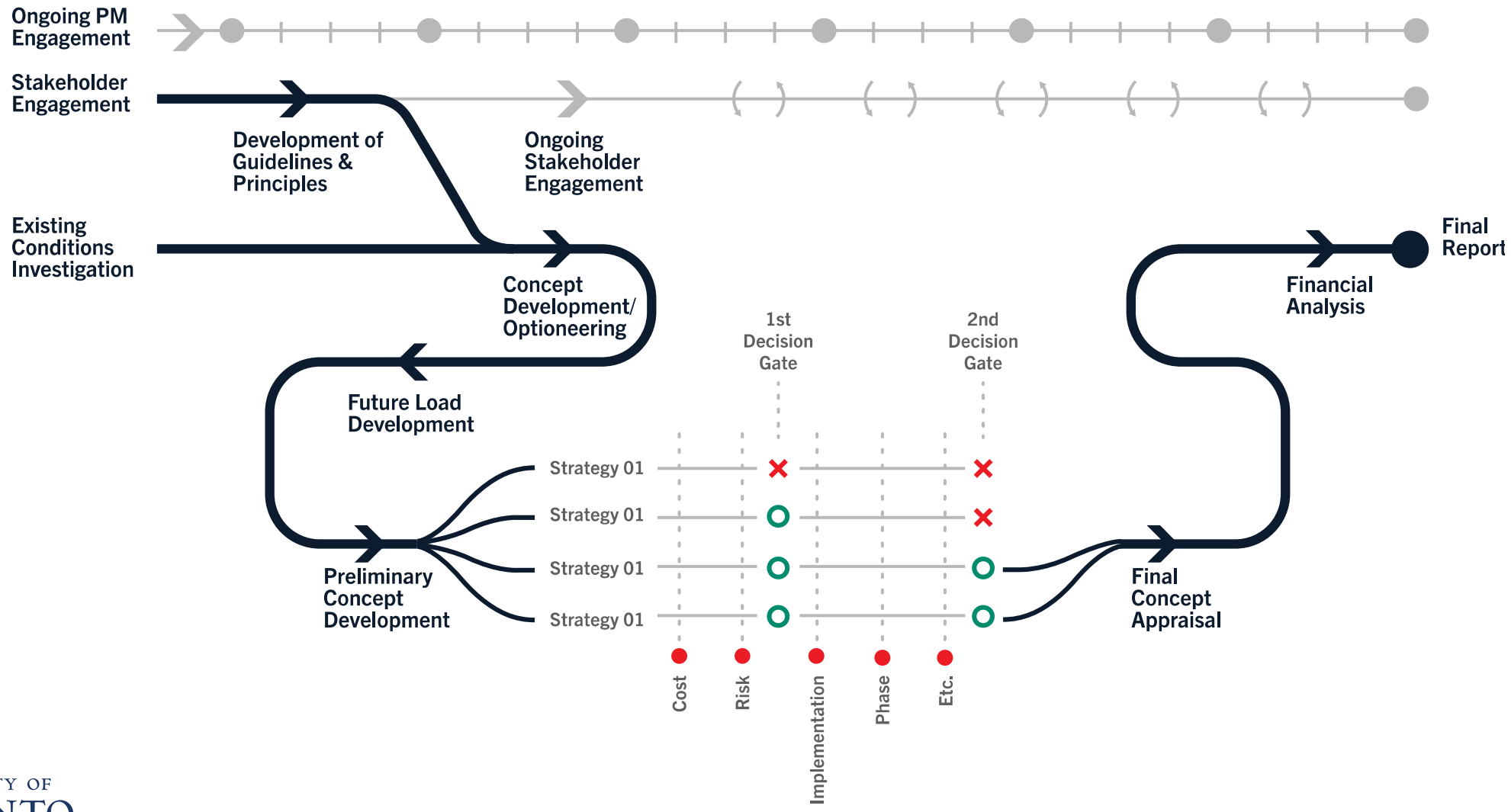


A CLIMATE POSITIVE CAMPUS

Developing the plan

DEVELOPING OUR PLAN



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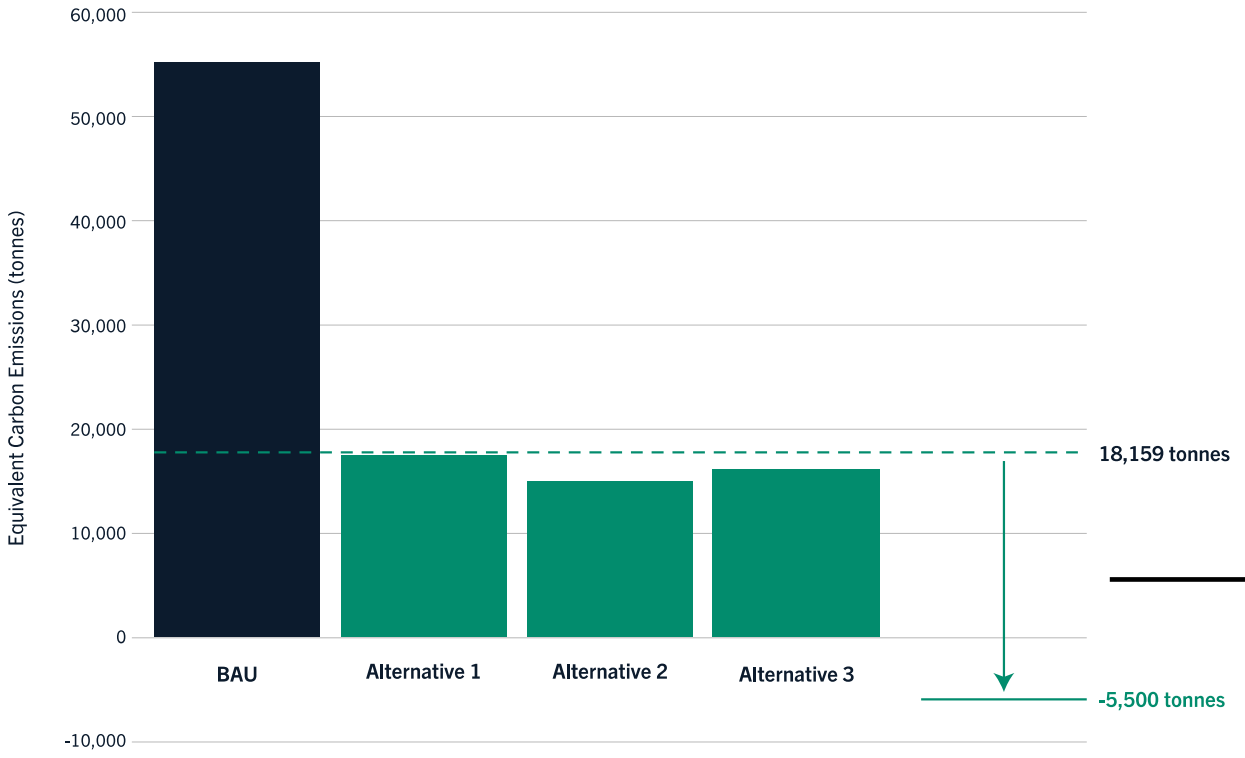
EQUIVALENT CARBON EMISSIONS – 2050



Emissions offset from large-scale, University-owned solar farms and other emerging technologies

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EVALUATION MATRIX

Category	Weight	Criteria	Alternative 1	Alternative 2	Alternative 3
Environmental	**30%**	Decarbonization, efficiency, environmental impact	**18**	**21**	**15**
Resiliency	**15%**	Flexibility, and future proofing, space	**12**	**9**	**9**
Operational	**20%**	Digitization, operation, compatibility	**18**	**14**	**15**
Social	**5%**	Human impact , campus, culture	**3**	**3**	**3**
Economic	**30%**	Capital, O&M, Risk	**19**	**15**	**15**
		TOTAL	**69**	**62**	**56**

Multi-divisional steering committee, consisting of faculty and administrative leadership evaluated the alternatives

Note: Weighted score are shown as rounded numbers

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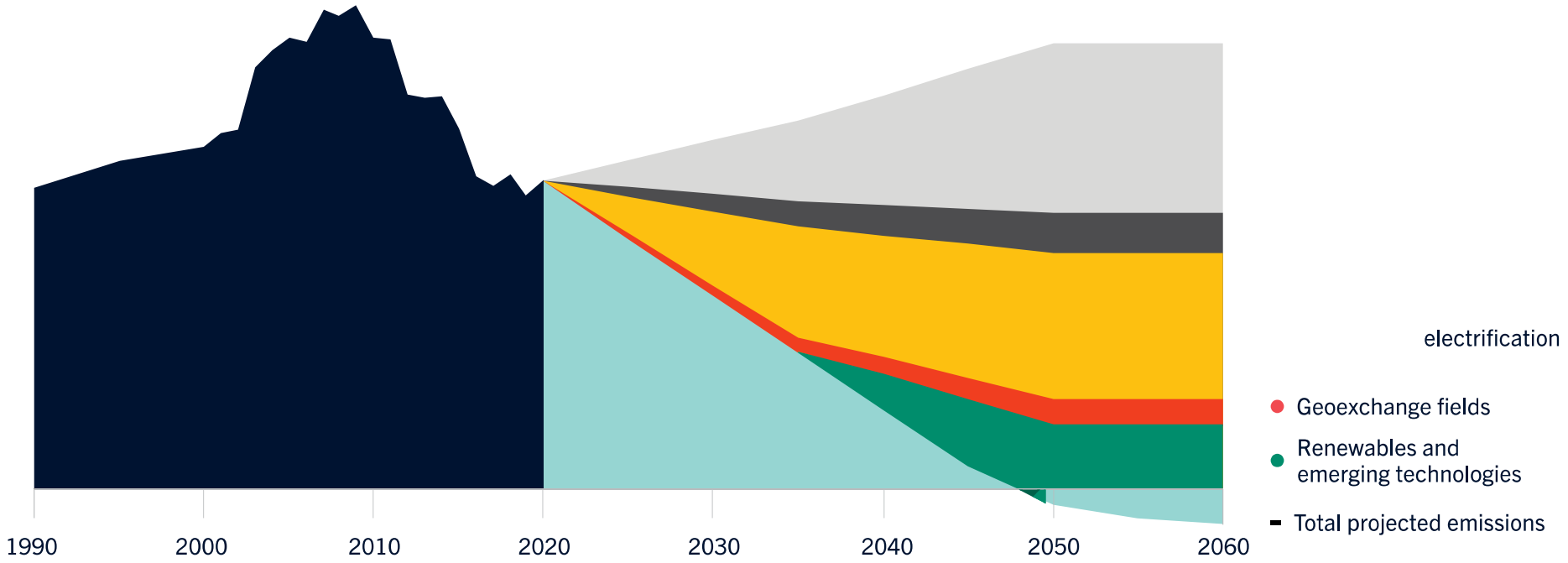
2050 CLIMATE POSITIVE PLAN

St. George Campus



climatepositive@utoronto.ca

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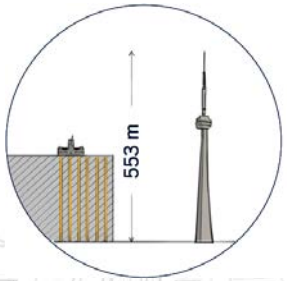
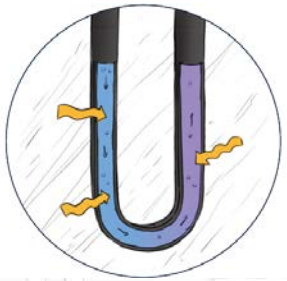
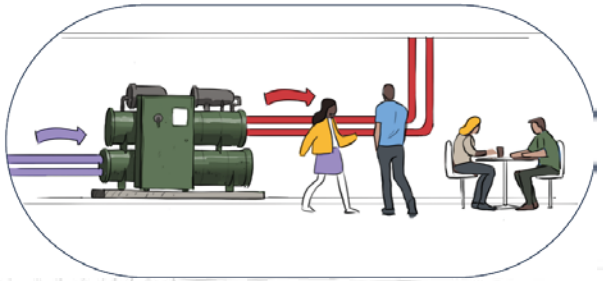
CANADA'S LARGEST URBAN GEOEXCHANGE SYSTEM



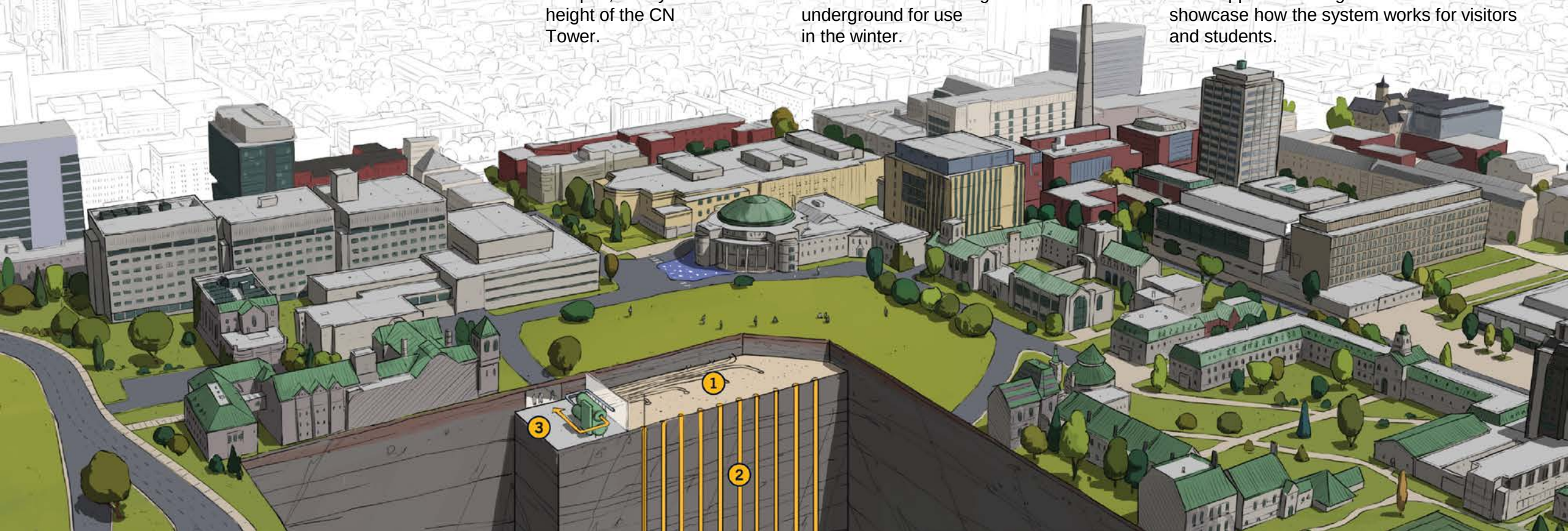
1 — Over 370 boreholes have been drilled 250 metres deep under front campus, nearly half the height of the CN Tower.



2 — U-shaped pipes are inserted into each borehole. Water is circulated through this system, taking excess heat from buildings in the summer and storing it underground for use in the winter.

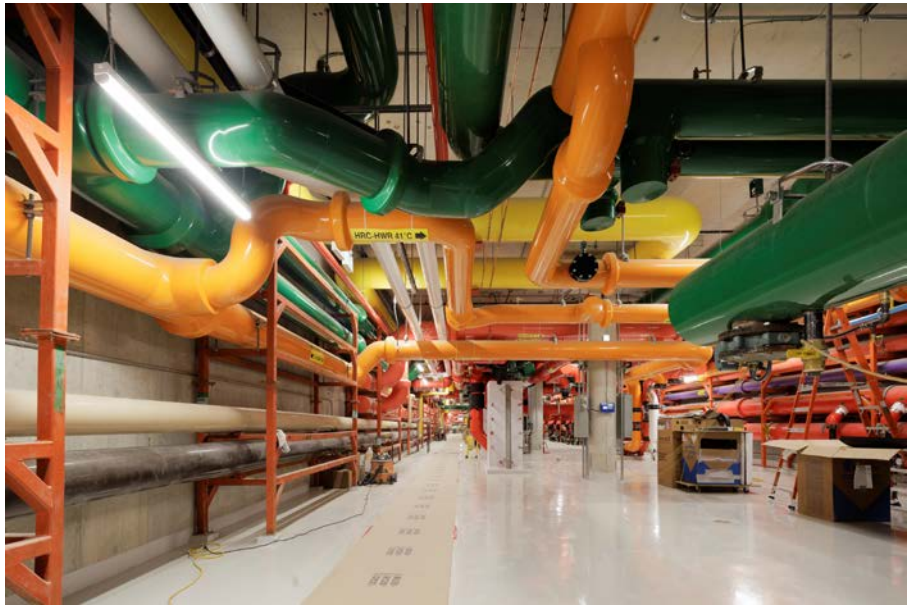


3 — Heat pumps circulate the water, transferring heat to or from the University's building ventilation systems. This installation will feature an underground display and serve as an applied learning classroom to showcase how the system works for visitors and students.



GEOEXCHANGE DISPLAY

Landmark Garage – Pavilion Entrance



Learn more about Project Leap, or book a geoexchange tour:
https://www.fs.utoronto.ca/projects/project-leap/

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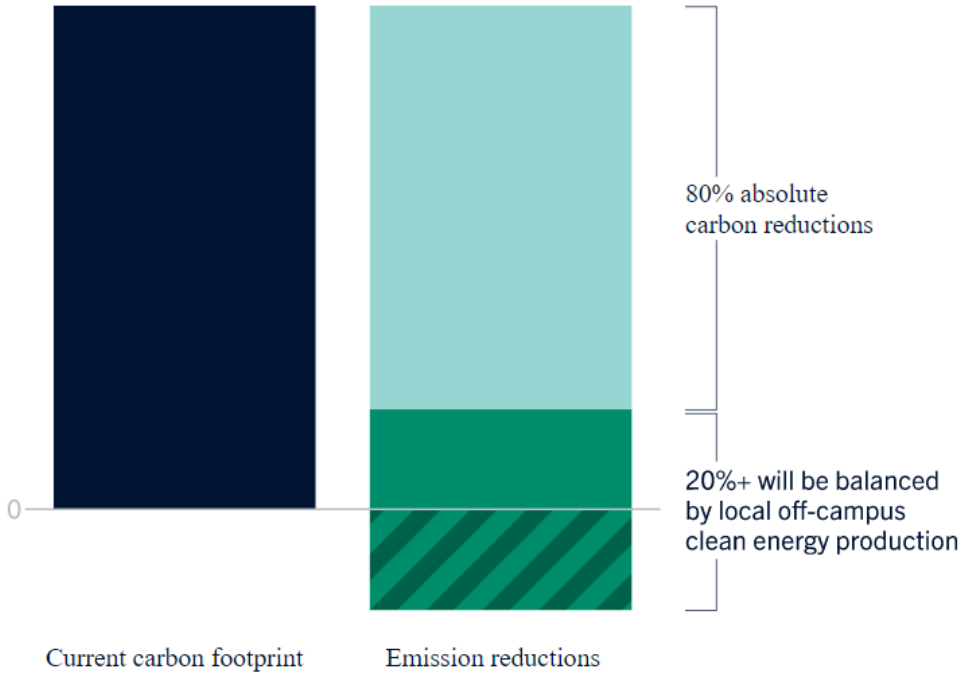
LEVERAGING OFFSITE GENERATION

By leveraging offsite generation, UofT would be able to offset the remaining +20% of carbon emissions

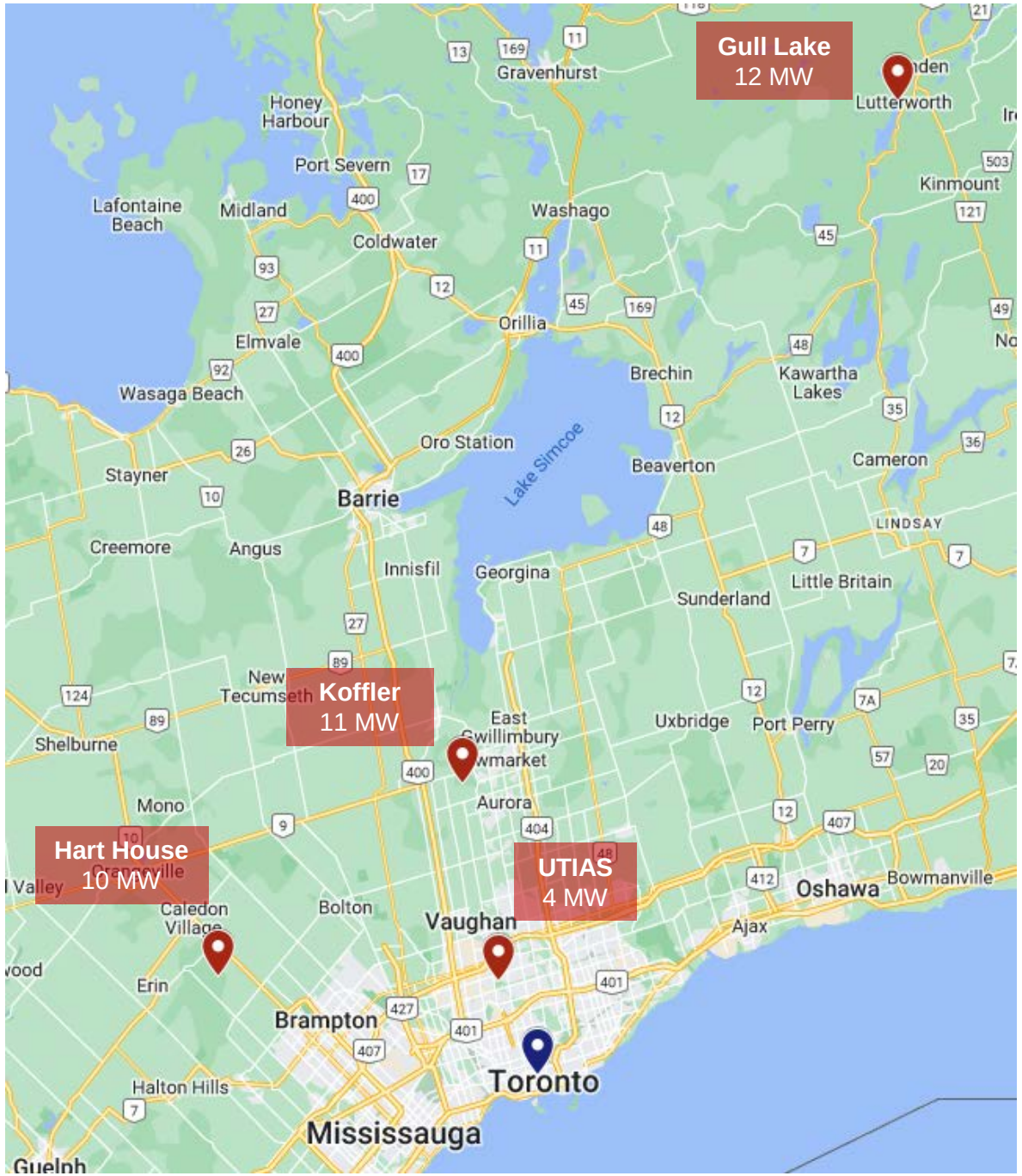
UofT has an opportunity at several sites across southern Ontario to install larger scale Solar installations to meet this need

Virtual Net Metering with our main accounts on the St George campus help to ensure that the projects are financially feasible



GROWING OUR RENEWABLE PORTFOLIO

POTENTIAL LOCATIONS



A CLIMATE POSITIVE CAMPUS

Project LEAP

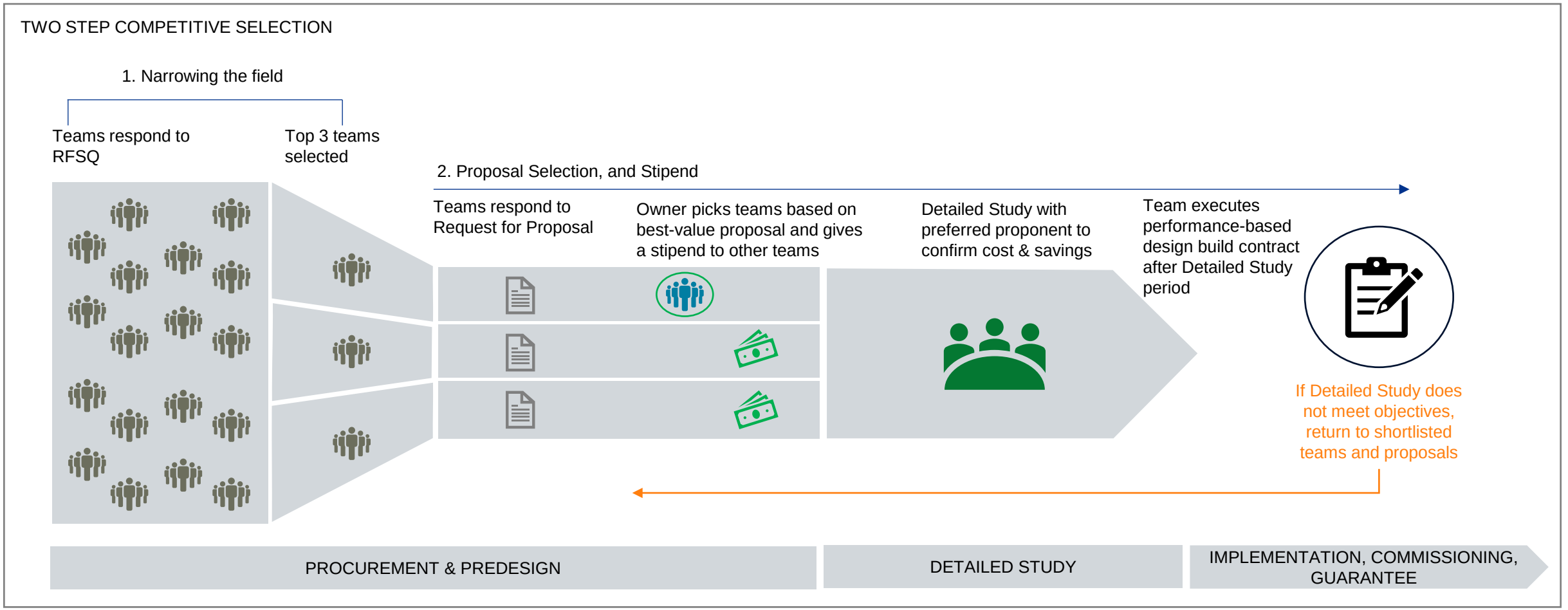
The first step in our plan

PROJECT LEAP

UNIVERSITY OF TORONTO

https://www.youtube.com/watch?v=bdaPLpwHjwk

PROJECT LEAP – OUTCOMES-BASED PROCUREMENT



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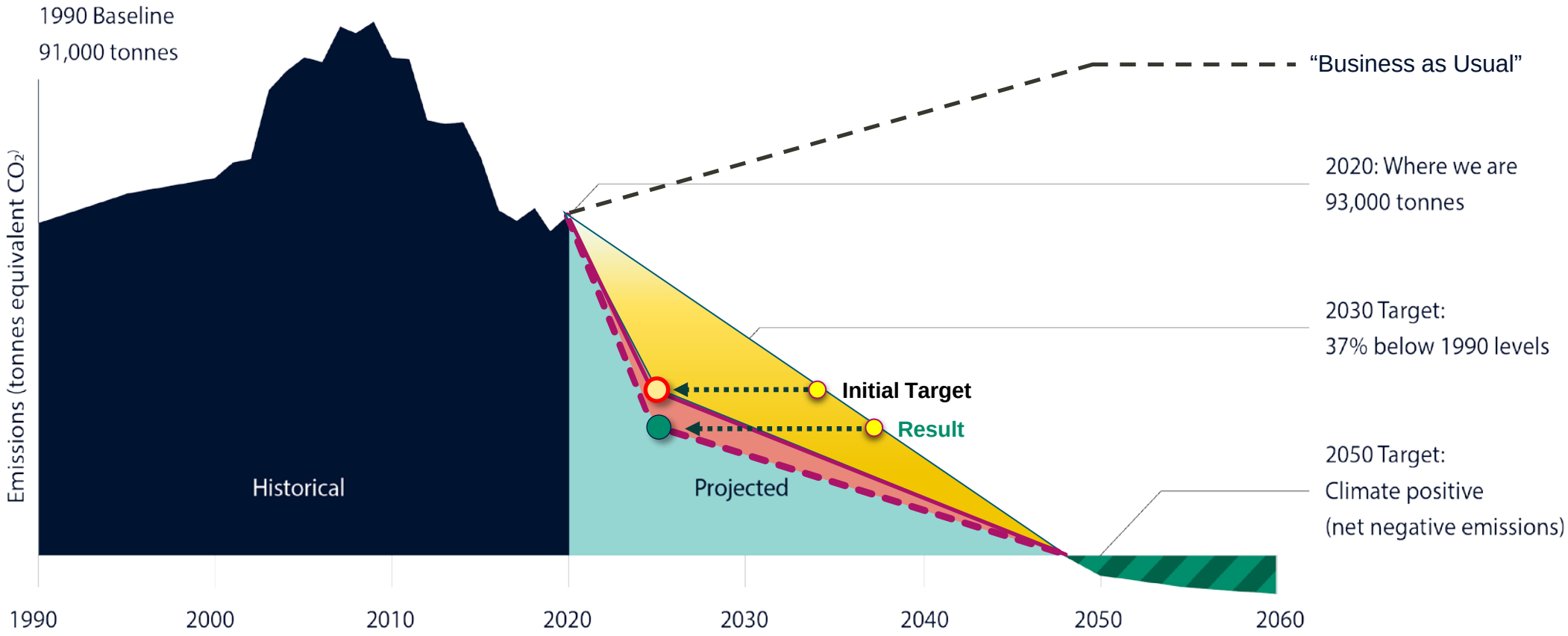
Reference: *How-To Guide for Energy-Performance Based Procurement*
U.S. Department Of Energy, Building Technologies Program

PROJECT LEAP

One-of-a-kind carbon reduction project

- ✓ Reduction of emissions by over 50%
- ✓ Energy Use Intensity reduction by > 40%
- ✓ No increase to utilities budget; NPV positive over 26 years
- ✓ Advances climate positive strategy by 10 years
- ✓ Reduces an incremental > 400,000 tons of carbon



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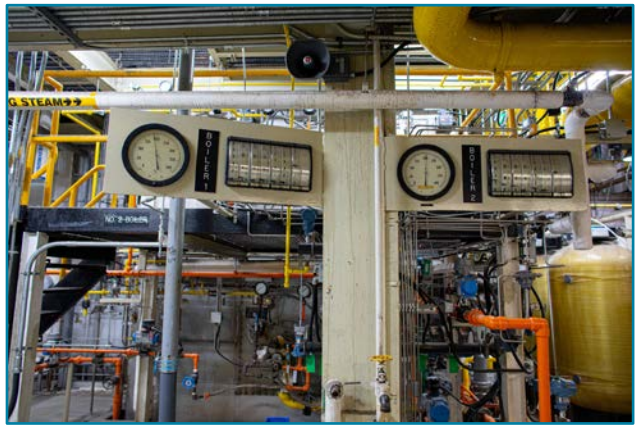
PROJECT LEAP – SUMMARY / STATUS

One project that addresses > 50% of our scope 1 & 2 emissions



District Energy Modernization

Reduce natural gas

- Electric boilers
- Industrial heat pumps
- Demand management

Building Optimization

Reduce consumption

Deep Energy Retrofits

- Terrence Donnelly CCBR
- Leslie L. Dan Pharmacy
- Medical Sciences, Lash Miller, Fitzgerald

Geoexchange Integration

Energy Recovery and Storage

- Enable active heat recovery
- Tie into district energy

Status

- ✓ Boiler removal complete
- ✓ Electric boilers installed
- ✓ Heat pumps procured

- ✓ Lab mockups complete
- ✓ Client consultation in progress
- ✓ Retrofits in progress
- ✓ Lighting retrofits in progress

- ✓ Geoexchange commissioned
- ✓ Back under construction
- ✓ Heat pumps procured

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PROJECT LEAP 2.0

Deep energy retrofits

- LEAP 2.0 now in procurement
- Target 80% reduction in carbon for each
- Construction start target early 2025

- Dalla Lana School of Public Health
- Lawrence Bloomberg Faculty of Nursing
- Temerty Faculty of Medicine
- Faculty of Dentistry

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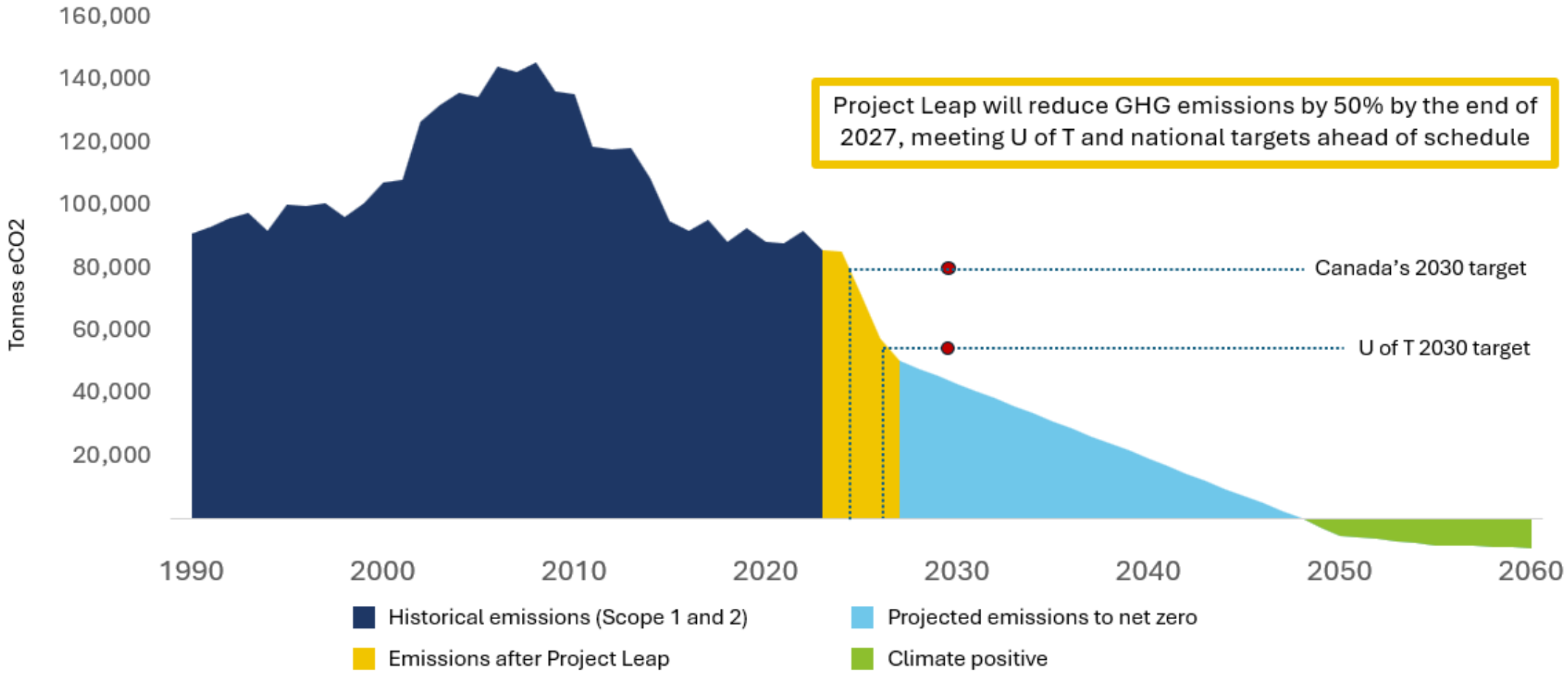
WHERE WE ARE TODAY & PROJECTION



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PROJECT LEAP 2.0

Deep energy retrofits

- LEAP 2.0 now in procurement
- Target 80% reduction in carbon for each building and 40% energy consumption reduction
- Construction start target fall 2025

- Faculty of Dentistry
- Rehabilitation Sciences Building
- Dalla Lana School of Public Health
- Exam Centre
- Old Administration Building

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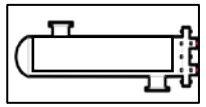
PROJECT HIGHLIGHTS

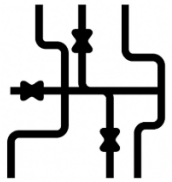
- Met project's ambitious KPIs

- Reduced steam networks in FOD and McCaul to a basement mechanical room in each



- Resilient design by including Steam backup while minimizing GHG impact

- Increased Solar-PV plant capacity at HSB by 50%



- Simplified RSB operation

3,117 Tonnes eCO_2	82% Reduction in U of T's Annual Scope 1 & 2 Greenhouse Gas Emissions
10,928,073 ekWh	41% Reduction in total electrical and thermal energy

40.7 % Energy Savings

82 % GHG Savings

DELIVERABLES SUMMARY

Deferred Maintenance

- Elimination of steam network and critical operational assets
- Ventilation system renewal, and associated heating and cooling
- Replacement of obsolete controls in critical spaces
- Replacement of end-of-life electrical systems

New Infrastructure to support programmatic growth for Dentistry

- Increased electrical capacity for future expansion considerations
- Additional ventilation and humidification to Clinic space (Clinic1 and pediatric)
- Adding resiliency to Clinic 2 by enabling connection to building heating and cooling network over a standalone system and the associated risk mitigation of a single point of failure
- Connection of perimeter heating to emergency power

Investment in Energy and Carbon Savings

- Decarbonization by electrification of heating, humidification, domestic hot water and lab sterilization
- Reduction of energy use through implementing heat recovery and heat pumps to reuse wasted heat
- Improved efficiency and reliability of building heating and cooling ventilation through modernization of building automation systems
- LED lighting retrofits
- Installation of 150kW Solar PV panels
- Insulation of ventilation spaces to reduce energy usage

LEAP 3.0 - SYNERGY TOOL ANALYSIS

High Level Process Map

ASSET MANAGEMENT DATA
Uniformat renewal forecast
Current replacement values, FCI

MVPI

RPI

ENERGY DATA
Annual Thermal and Electrical Volumes

Energy, EUI, GHG, **EPI**

Emissions Factors

SPACE USE DATA
COU space categories, GSM, age

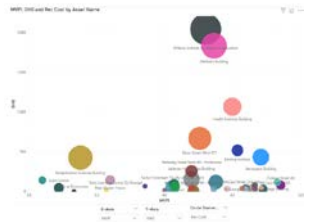
Building archetypes

Consolidated Database in Power BI

Output

Dynamic Visualizations based on filters

Export capabilities



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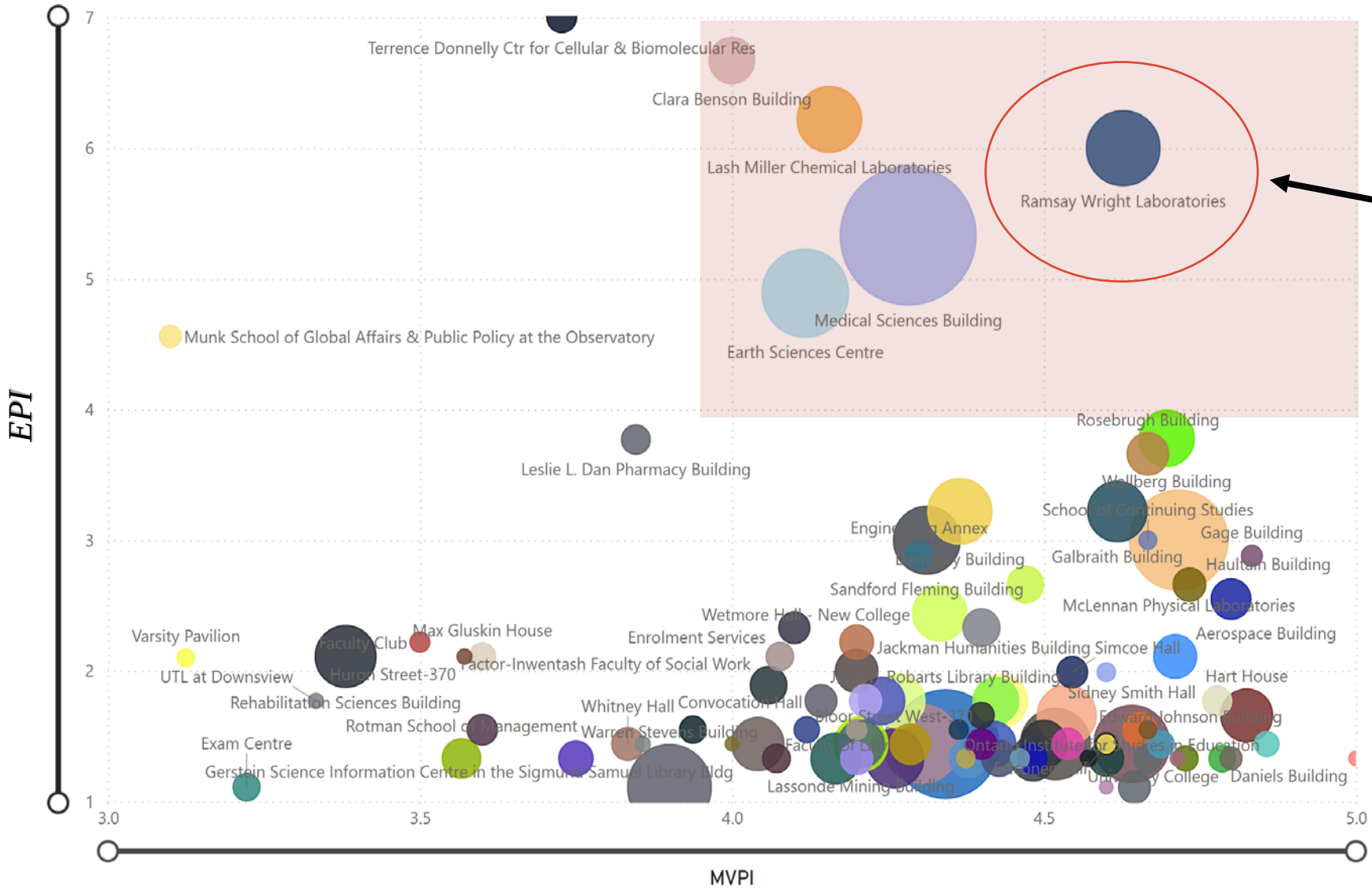
SYNERGY – VISUALIZING OPPORTUNITY



Ramsay Wright Laboratories as a targeted building for LEAP 3

THANK YOU!

Ron Saporta
ron.saporta@utoronto.ca

Scott Hendershot
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June 20, 2025

UNIVERSITY OF TORONTO

DEFY GRAVITY

Advance Industrial Mechanical

Advance Industrial Mechanical

Michael Genin

Founder of Canadian Division

AIM HVAC

Air-Source Boiler
for reliable decarbonization

High water temps

Reduces need for top-up heat

Colder ambient conditions

More hours of decarbonization

Reliable defrost cycle

Better compressor longevity

Smaller foot-print

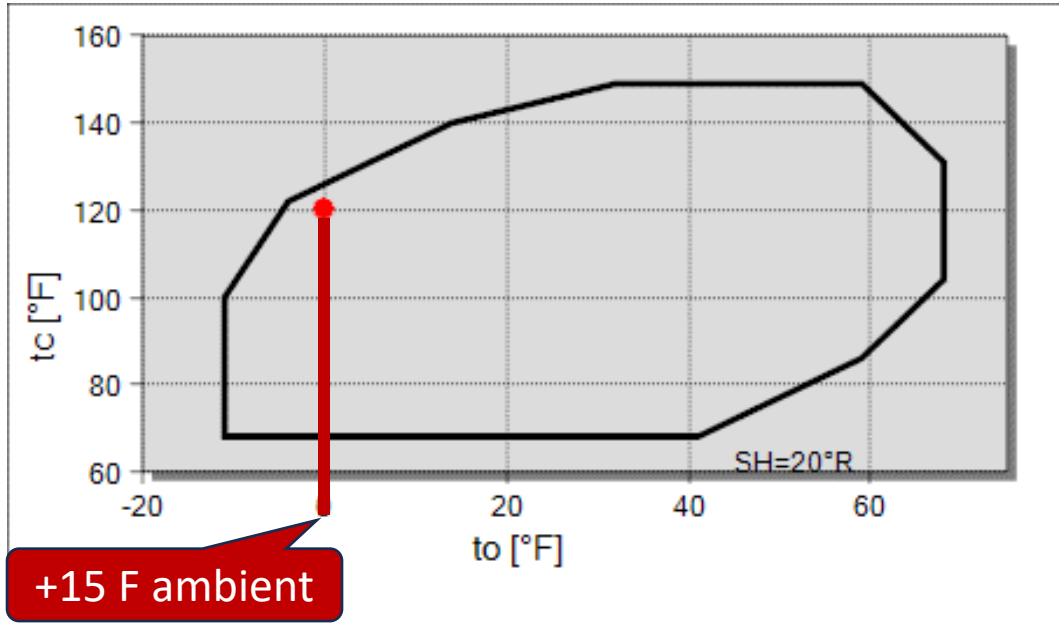
50% less space required

Michael Genin, P.Eng. | (647) 691-3831 | mgenin@air-eng.com

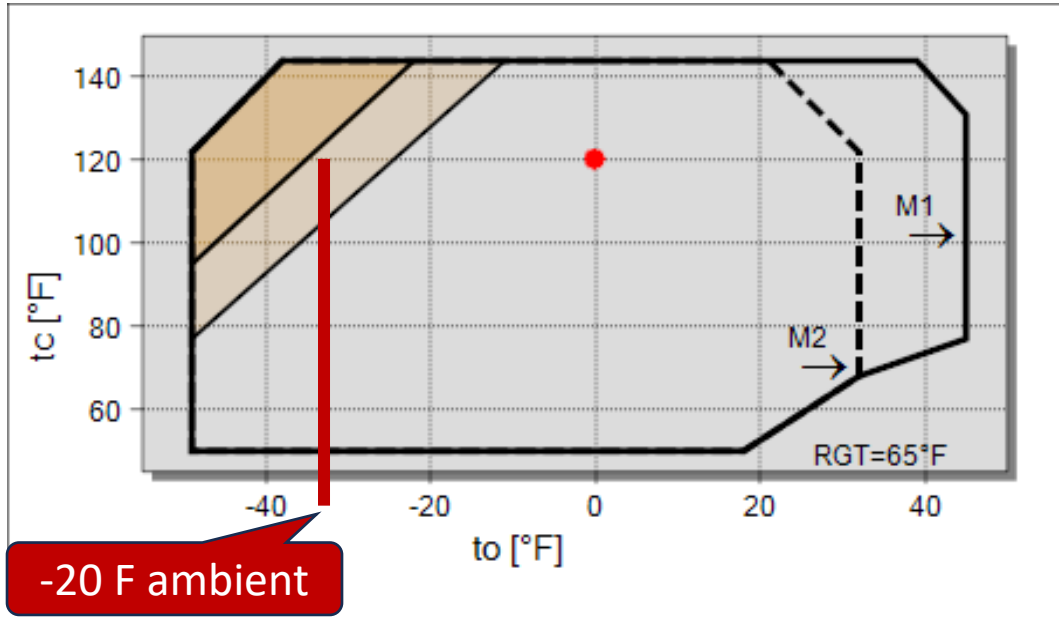
Issues with air-source heat-pumps

- **Limited hot water capabilities**
- **Unreliable defrost cycle**
- **Cooling efficiency is poor**
- **Physical size is limiting**

Refrigerant & Compressor Limits

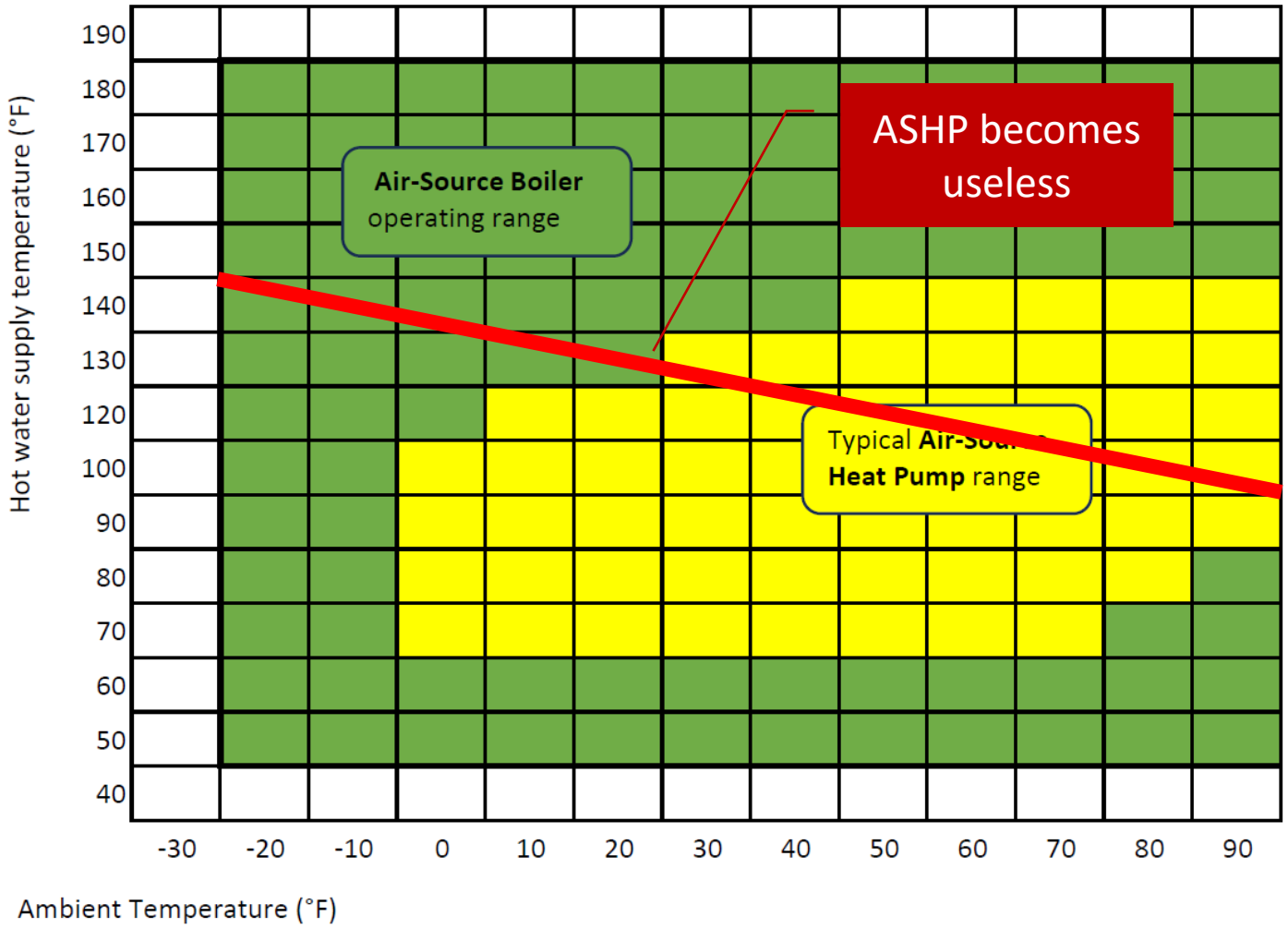


+15 F ambient

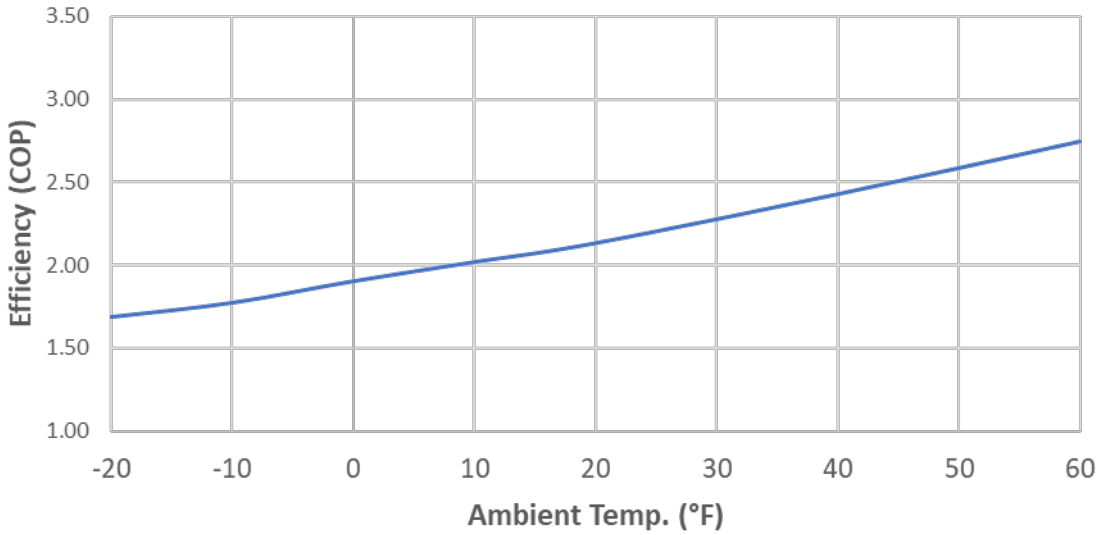


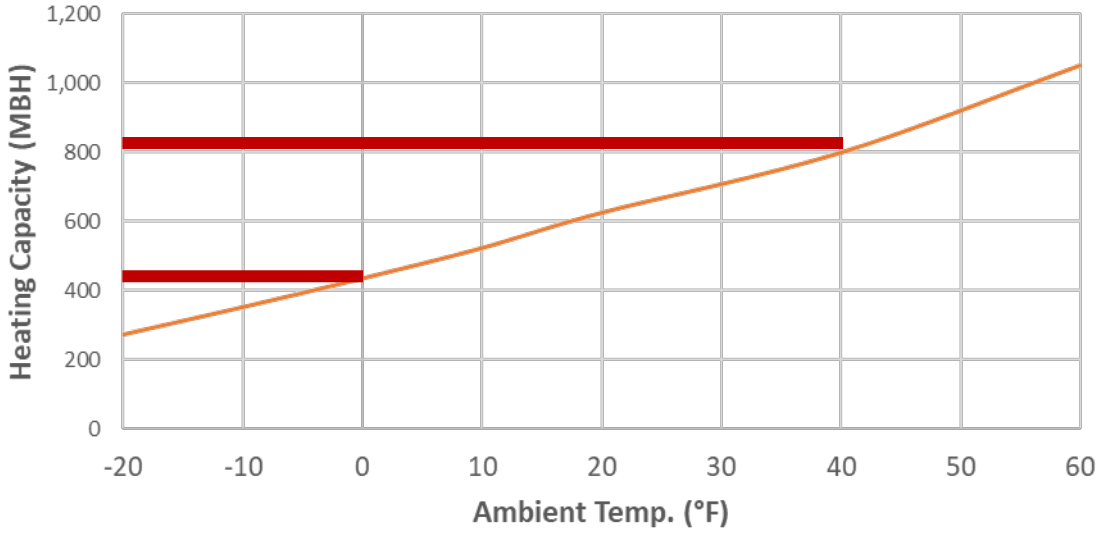
-20 F ambient

A wider range of operation



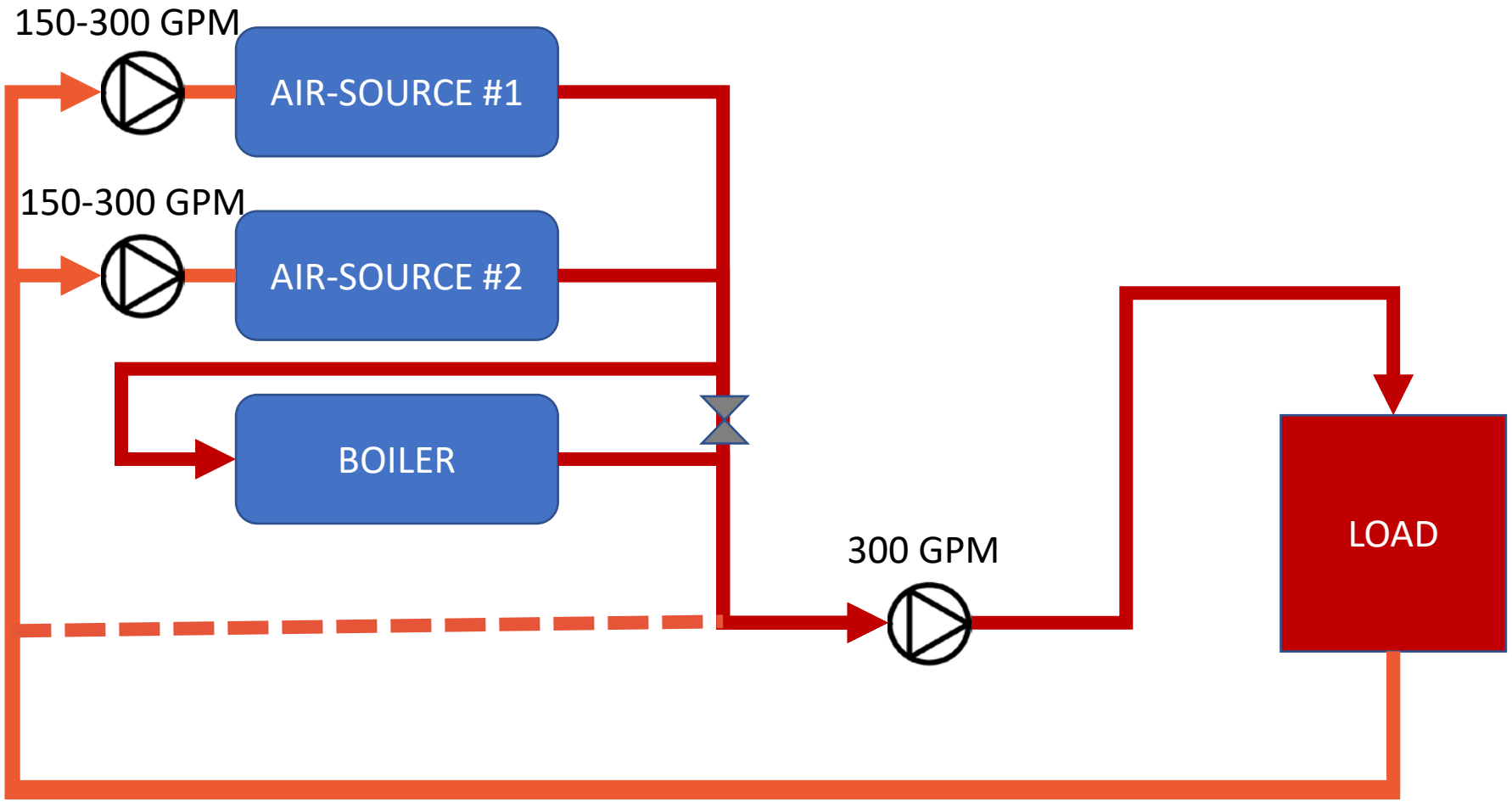
Efficiency and Capacity change drastically with OAT





Side-stream boiler for “top up”

Air-source units are unable to hit temp on design day



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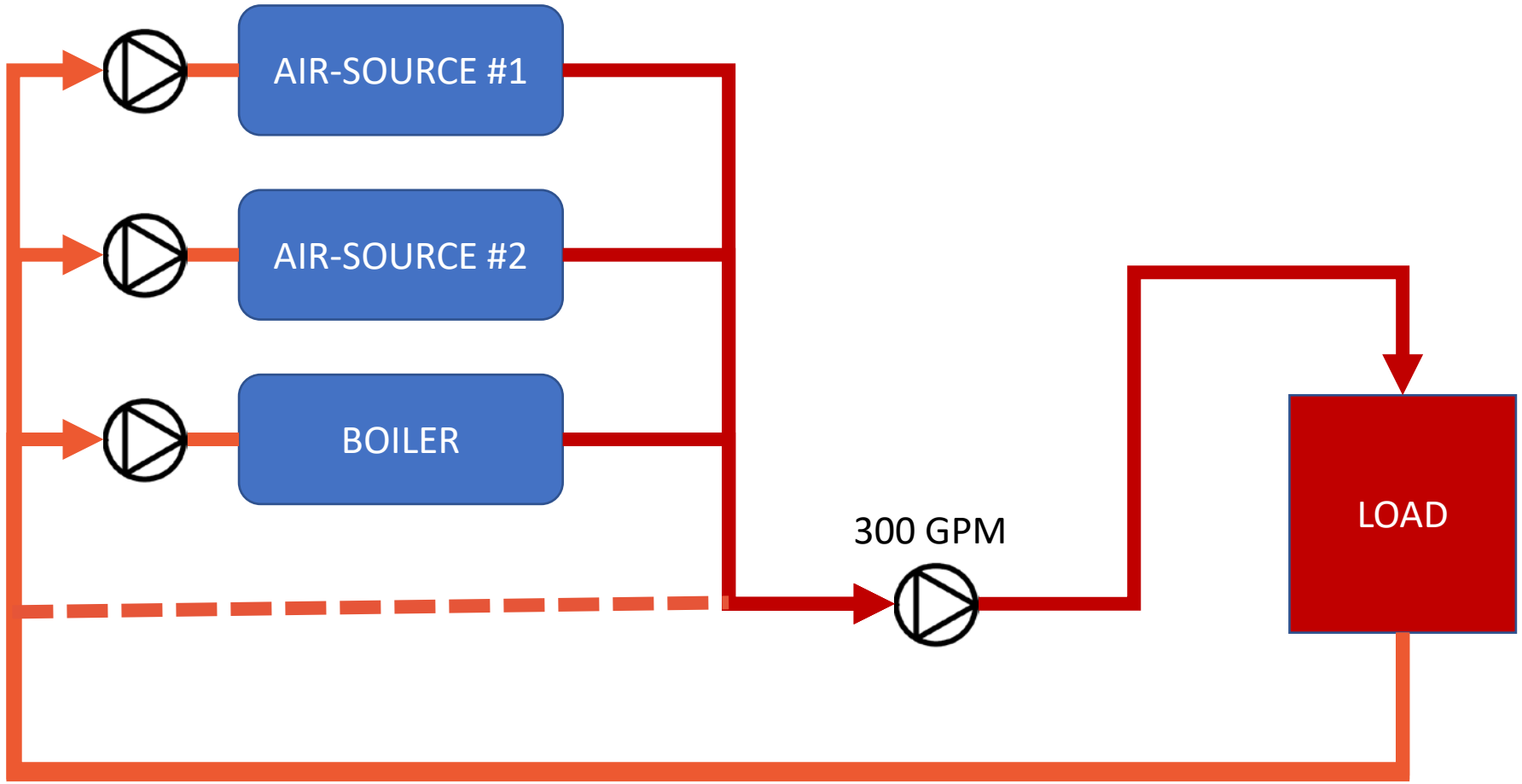
Parallel boiler for back-up only

Air-source units can hit temp on design day



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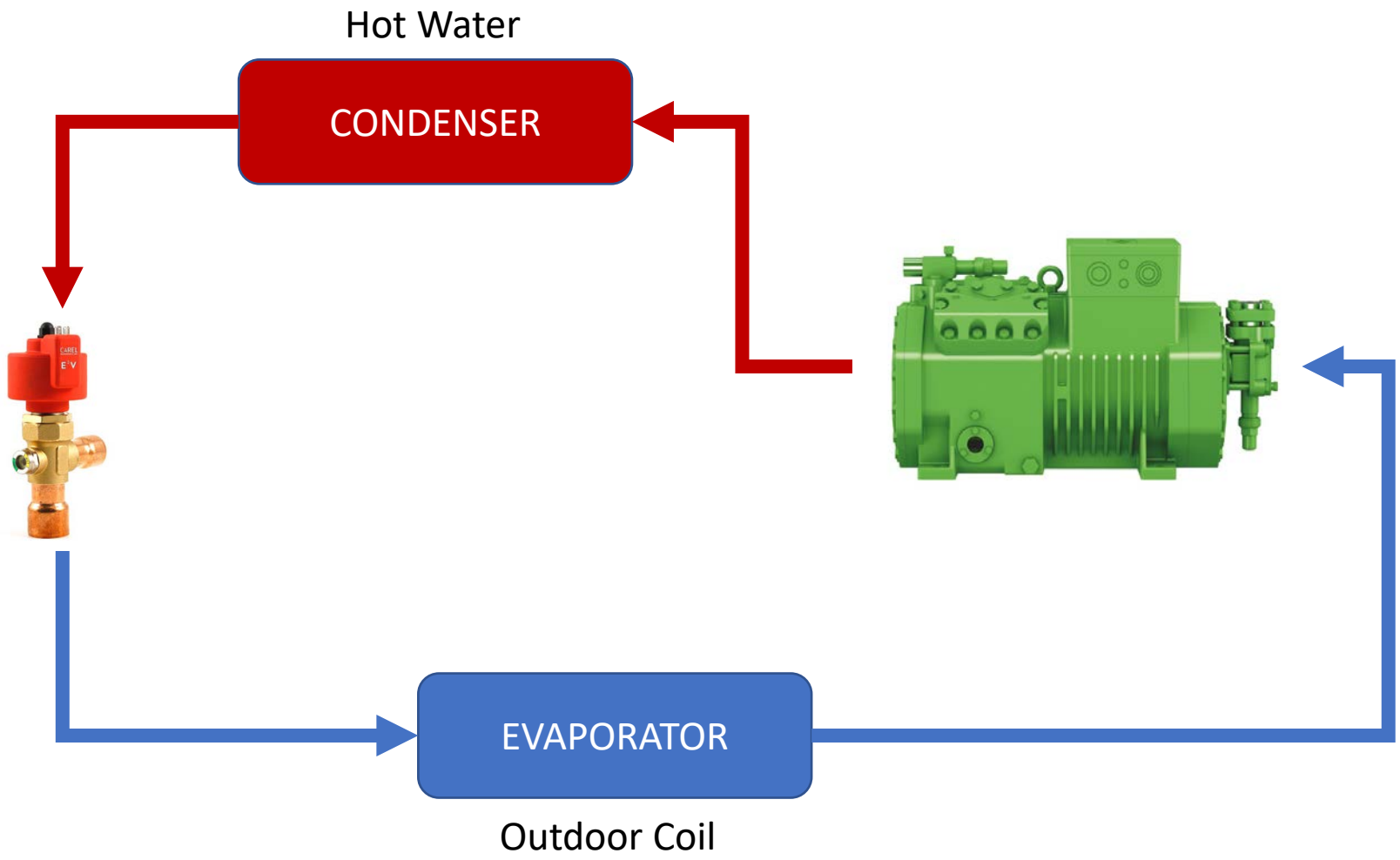
Tested and proven for cold climates

-20 °F
(-29 ° C)

Refrigeration cycle - **heating**



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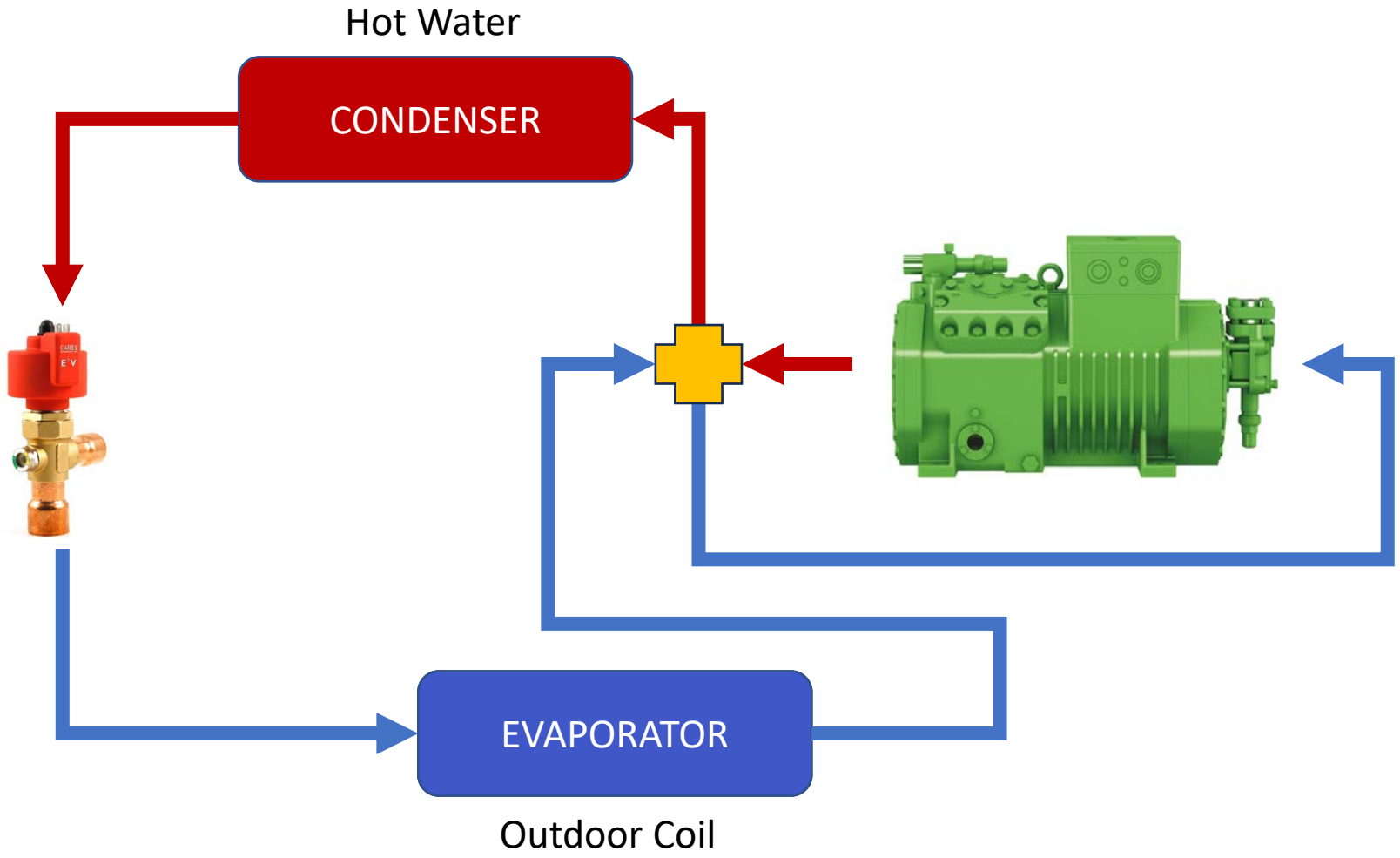
Reversing valve cycle - **heating**



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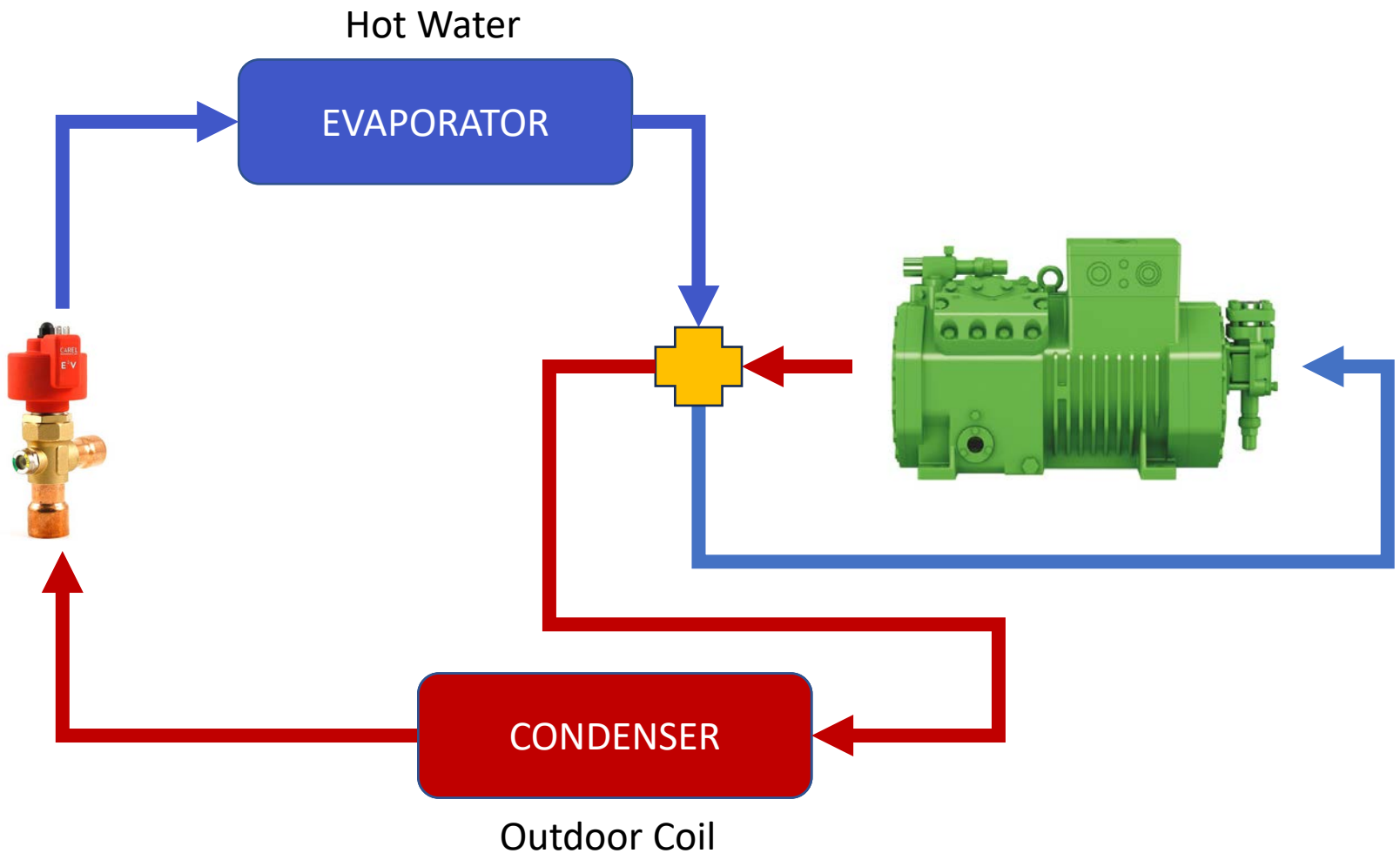
Reversing valve cycle - **defrost**



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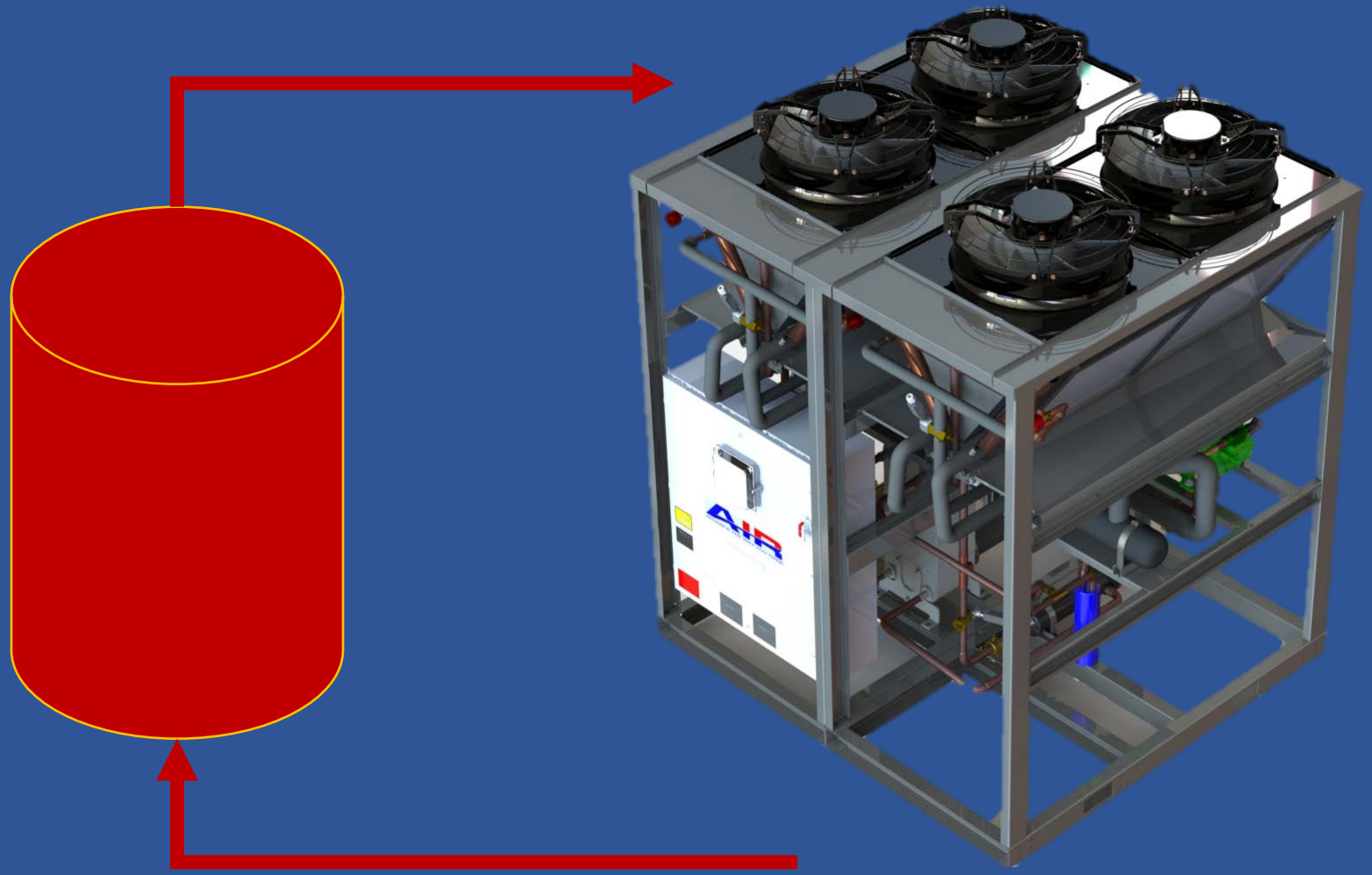
Reversing valve sucks heat out of your system for defrost



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Reversing valve sucks heat out of your system for defrost

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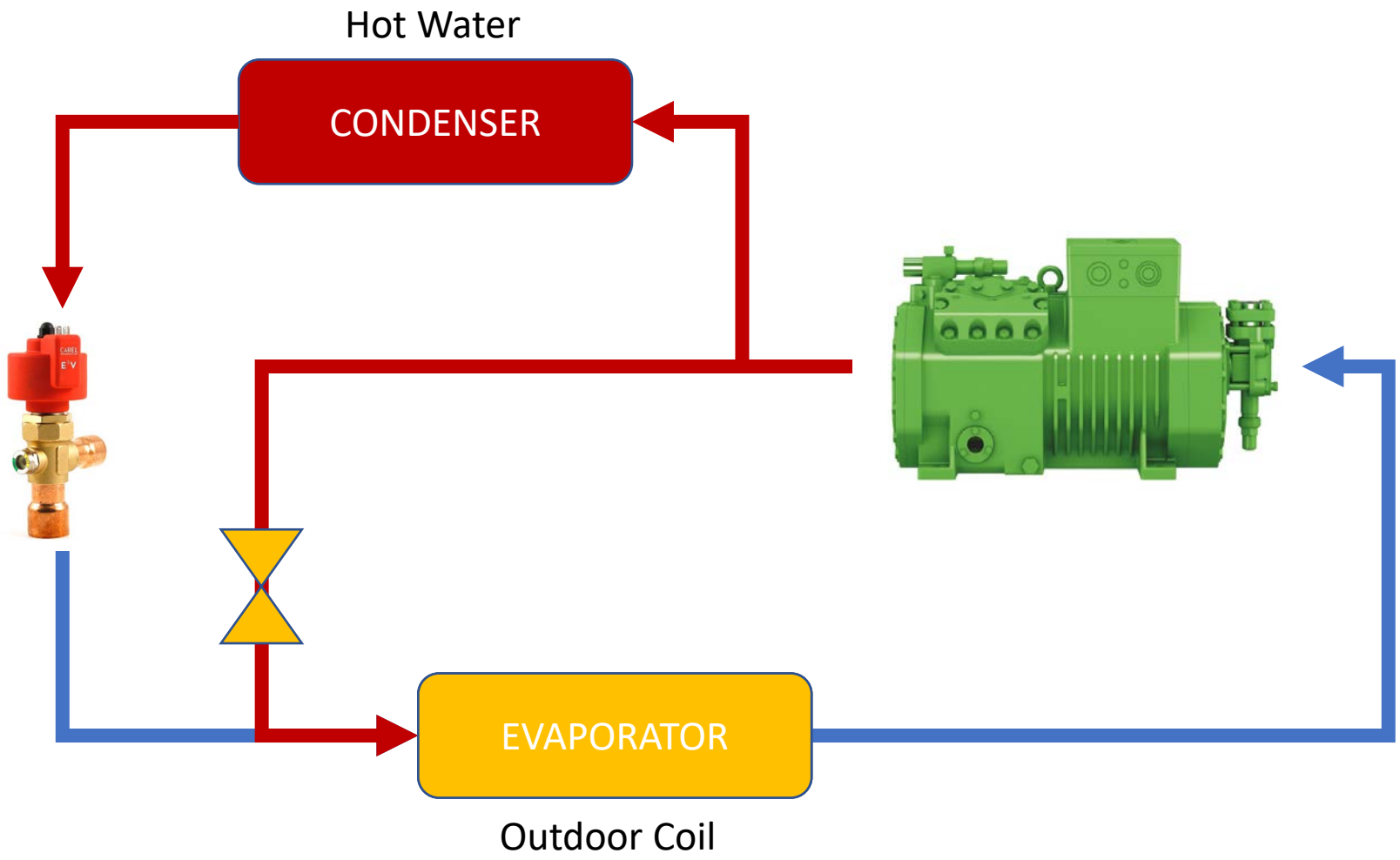
Hot gas **defrost** is more reliable



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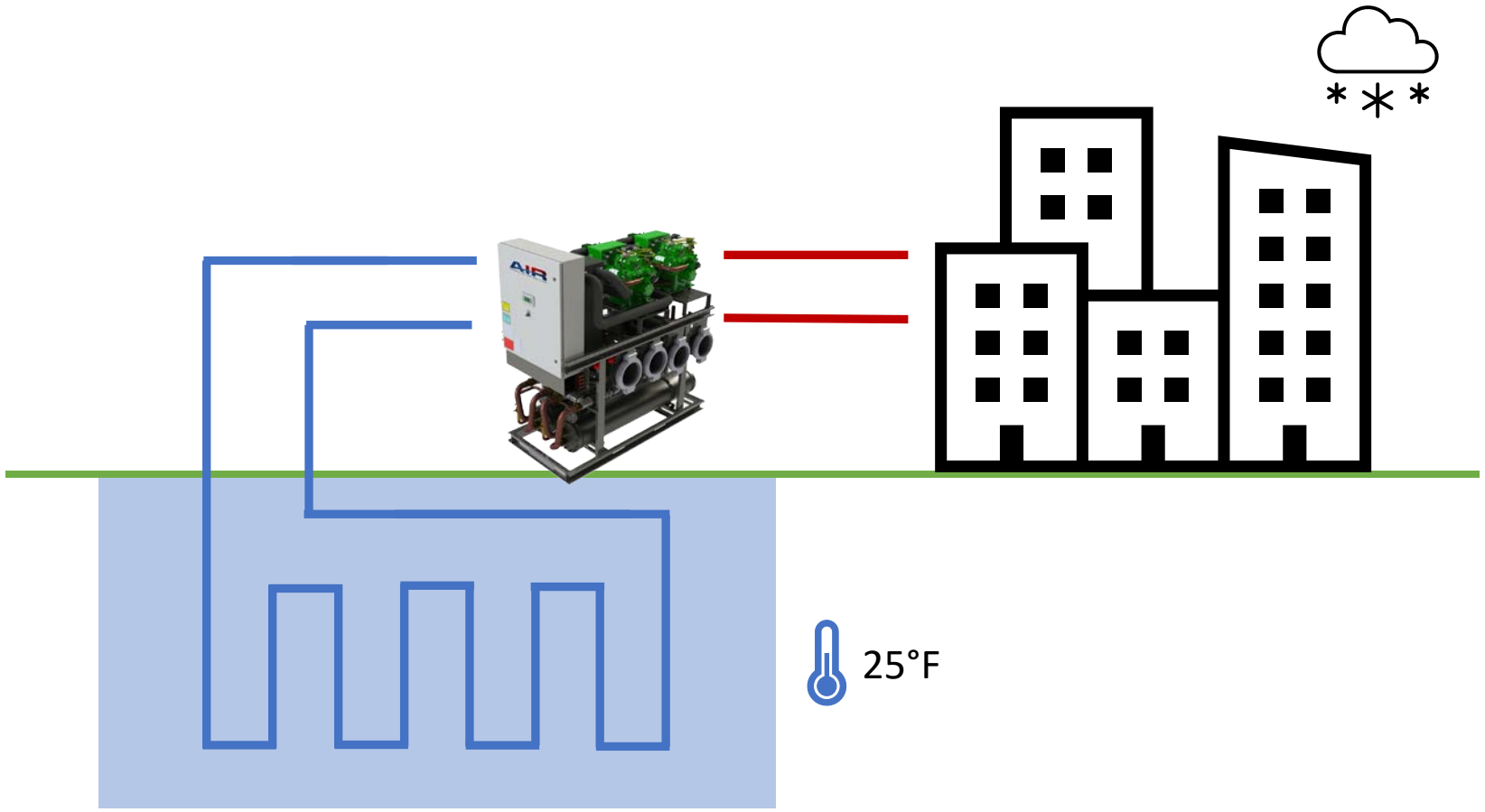
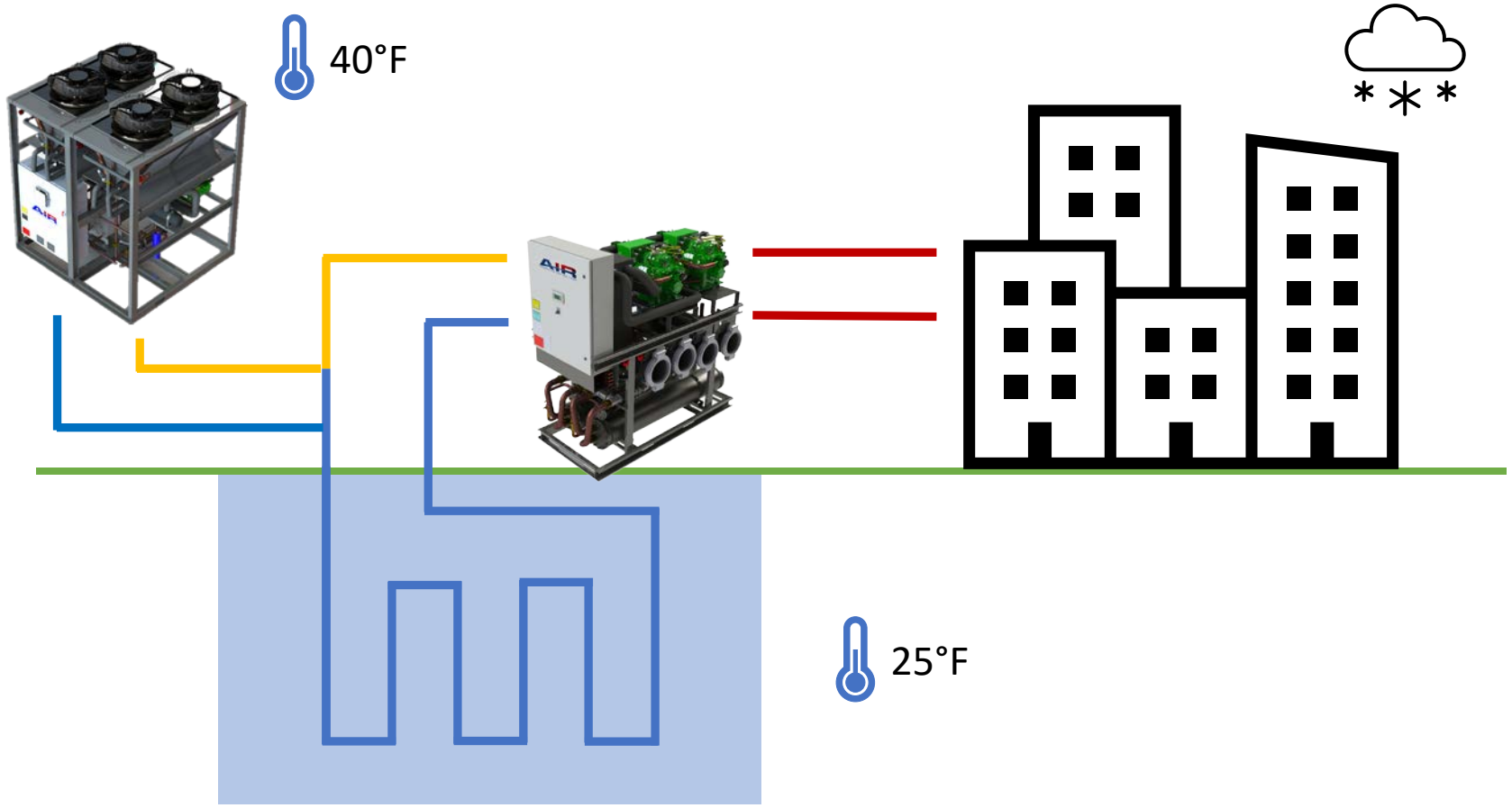
Full geothermal is very costly



A hybrid geo + air-source system is the best of both worlds



King’s Wharf

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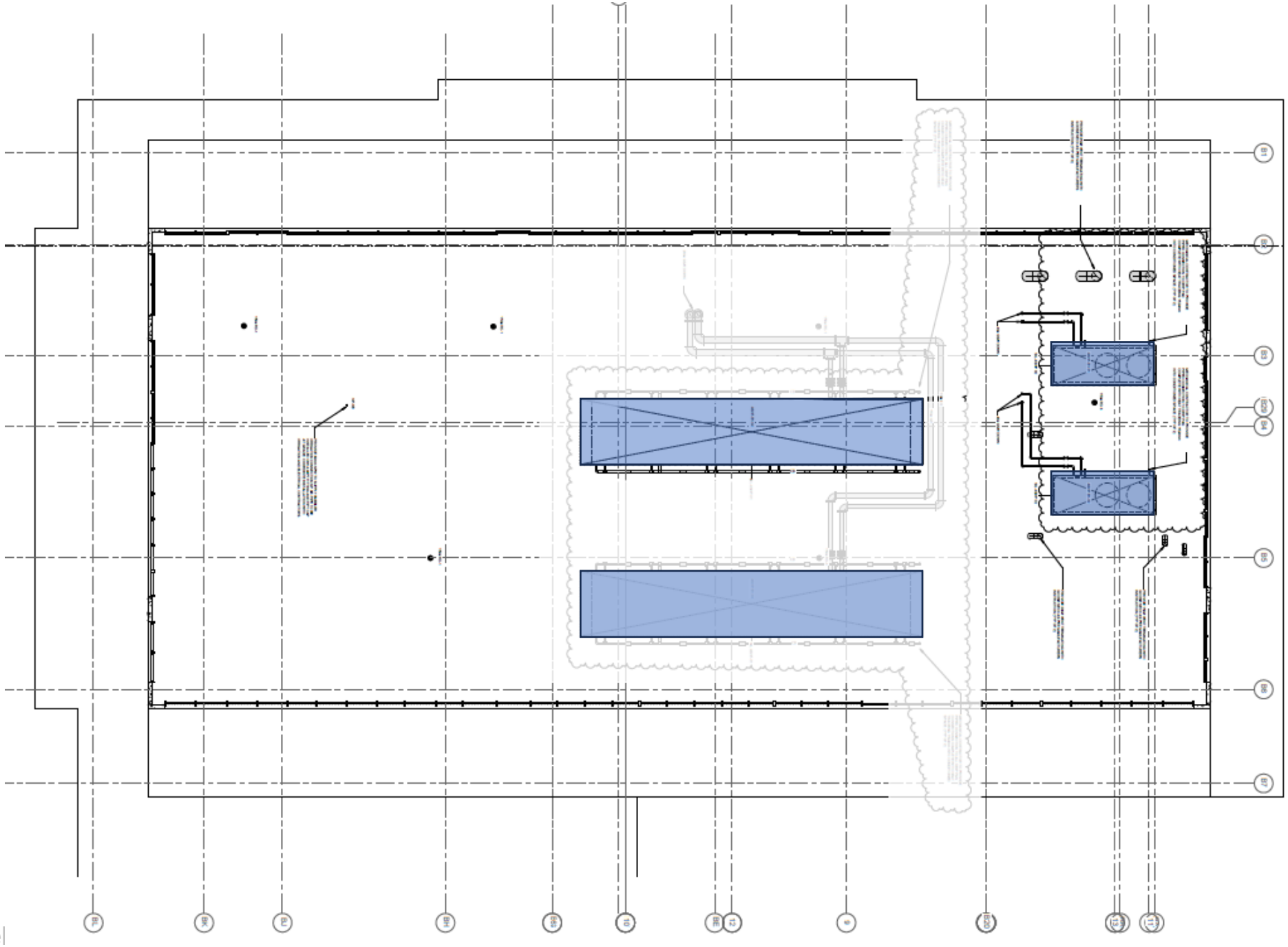
School Installation

Large condo project



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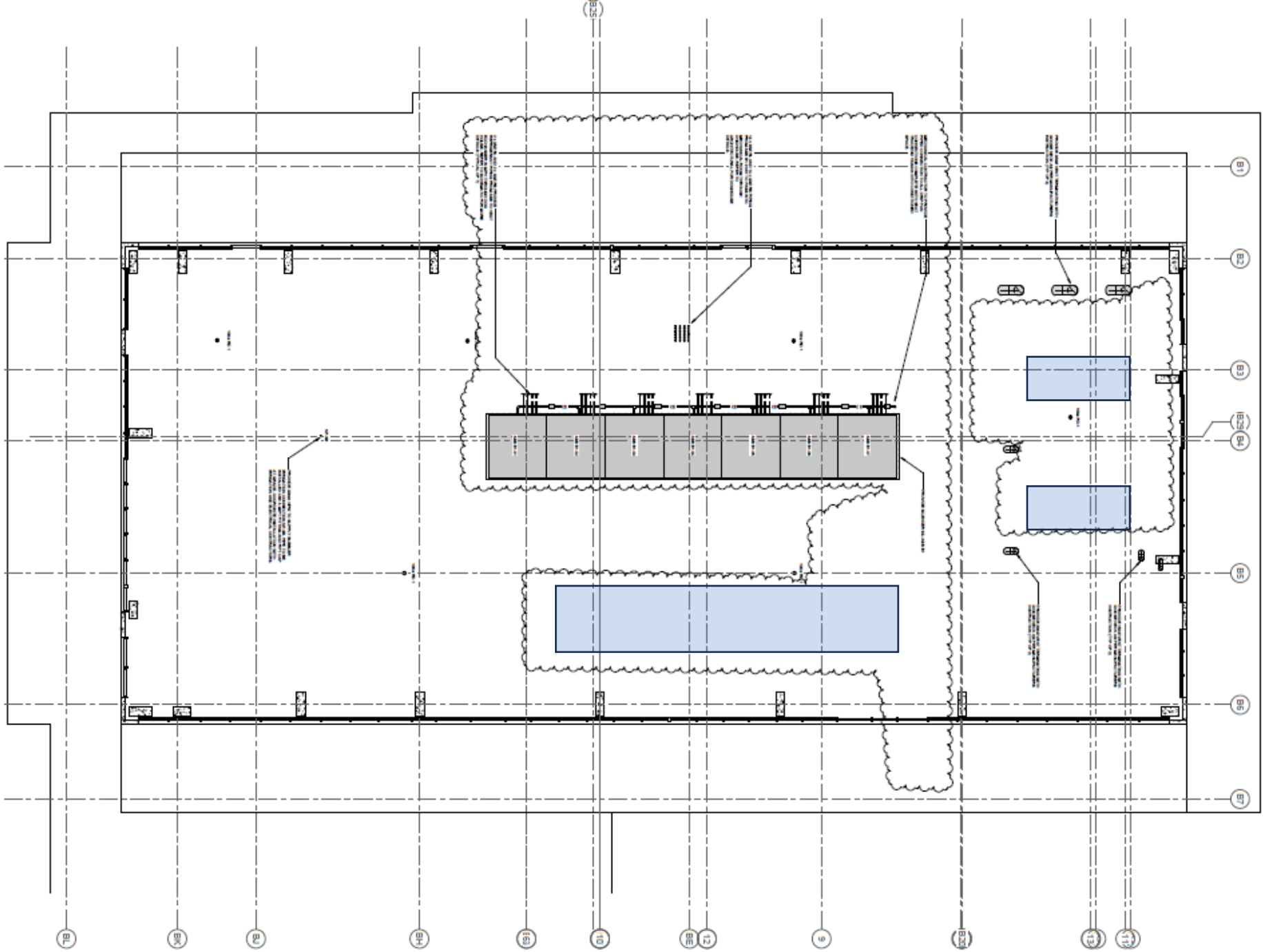

Michael

Air-Source Boiler makes reliable hot water at low ambient temps

High water temps

Reduces need for top-up heat

Colder ambient conditions

More hours of decarbonization

Reliable defrost cycle

Better compressor longevity

Smaller foot-print

50% less space required

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Q & A Session

GeoExchange Tour

Partners in Project Green

A Program of Toronto and Region Conservation Authority

Thank You!