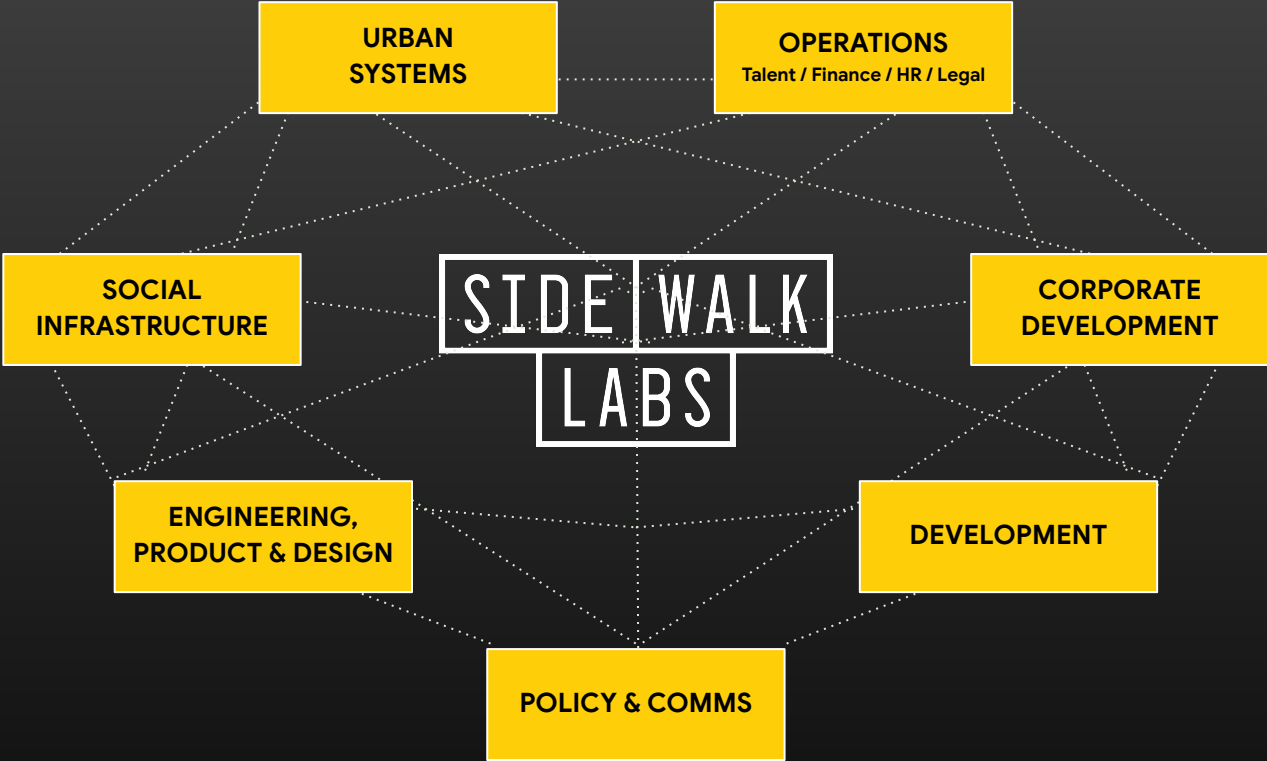


Affordable Electrification in Buildings

Who is Sidewalk Labs?

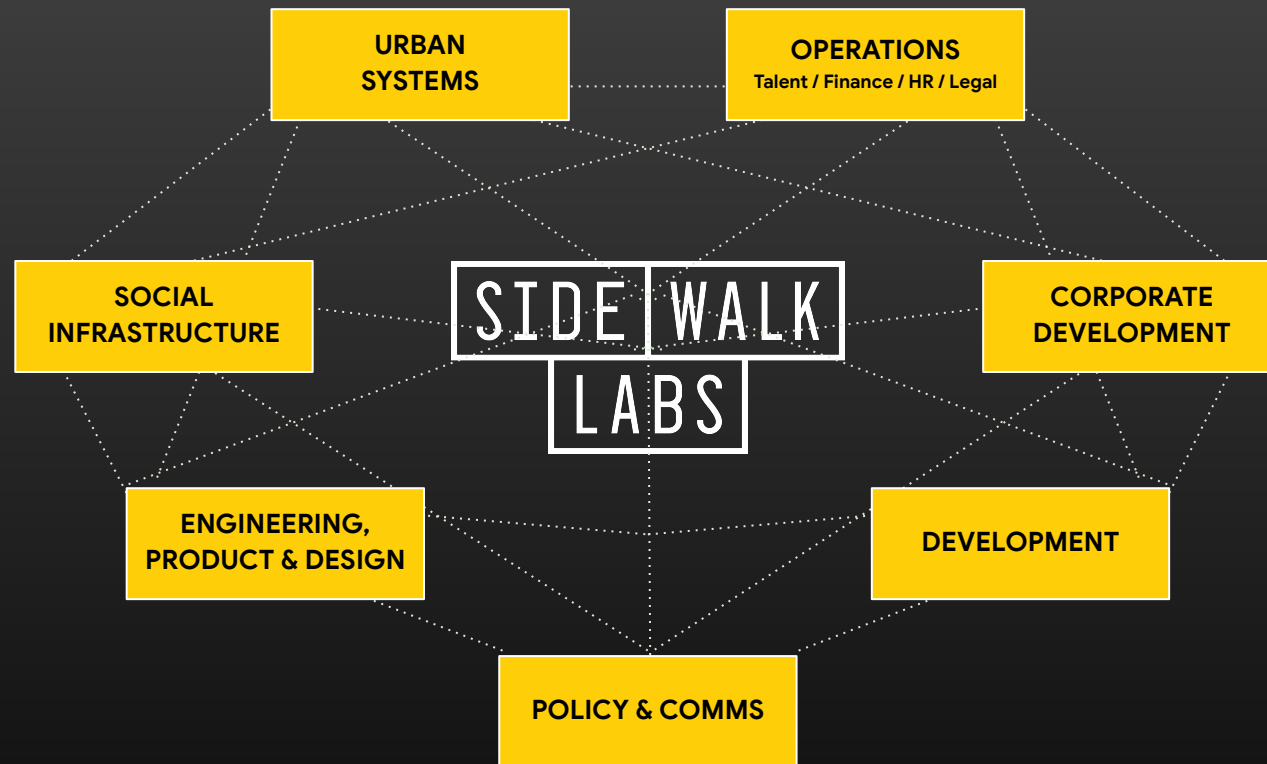


Bridging the Urbanist + Technologist Divide



Who is Sidewalk Labs?

Bridging the Urbanist + Technologist Divide



Project Goals for Quayside, Toronto



9,000+ Construction Jobs



Canadian Mass Timber Factory



40% Below-Market Housing



Towards Climate Positive



Streets that Work



Civic Data Trust

Consultants engaged for Sidewalk Labs development in Toronto



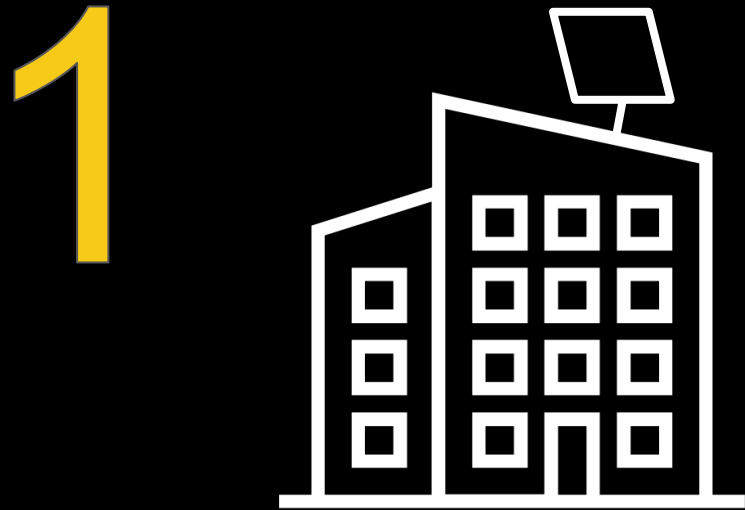
In addition to the generous contributions of multiple stakeholders and advisors, Sidewalk Labs' sustainability strategy has been informed by the following consultants:

- TurnCraft Advisors
- BuildingGreen Inc.
- Lawrence Berkeley Labs (US National Lab)
- Smarter Grid Solutions
- WSP - Sustainability and Energy
- Stantec - Design engineering work
- Kerr Wood Leidal
- *Building Studies*: Building EQ, Urban Equations and Energy Profiles Opti RTC
- Lion Advisors
- SD Global Advisors, LLC
- Deloitte (Infrastructure)
- TWG (The Working Group) - Software Company

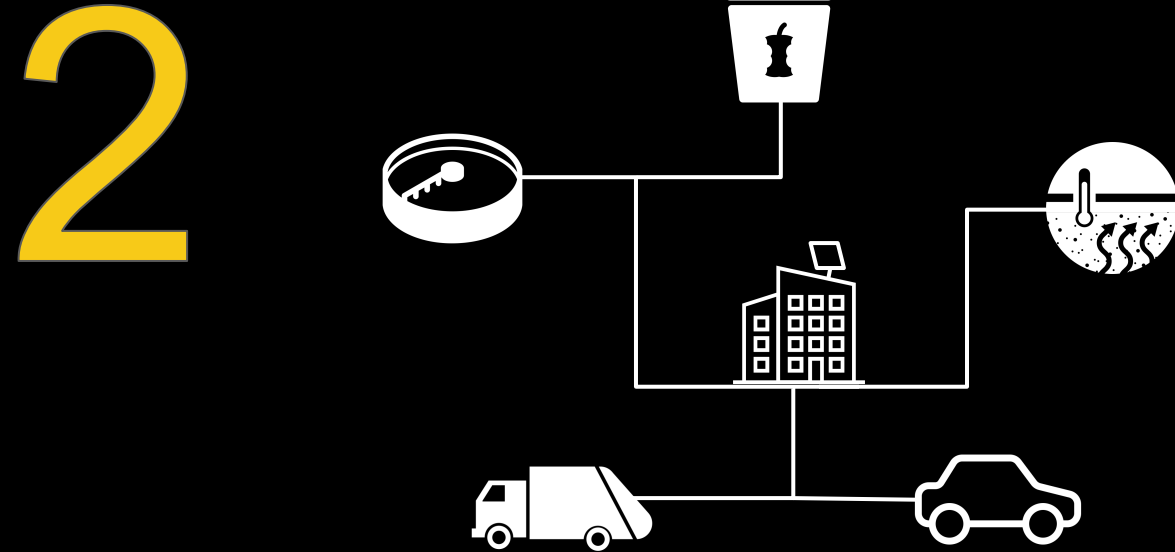
Sidewalk Toronto also engaged an Advisory Group to provide feedback throughout the process with representation from MaRS Cleantech, the Canada Green Building Council, the Atmospheric Fund, the Centre for Social Innovation, Project Neutral, Canadian Urban Institute, Quality Urban Energy Systems of Tomorrow (QUEST), among others.

What is climate positive?

Development that **reduces** city's overall GHG emissions

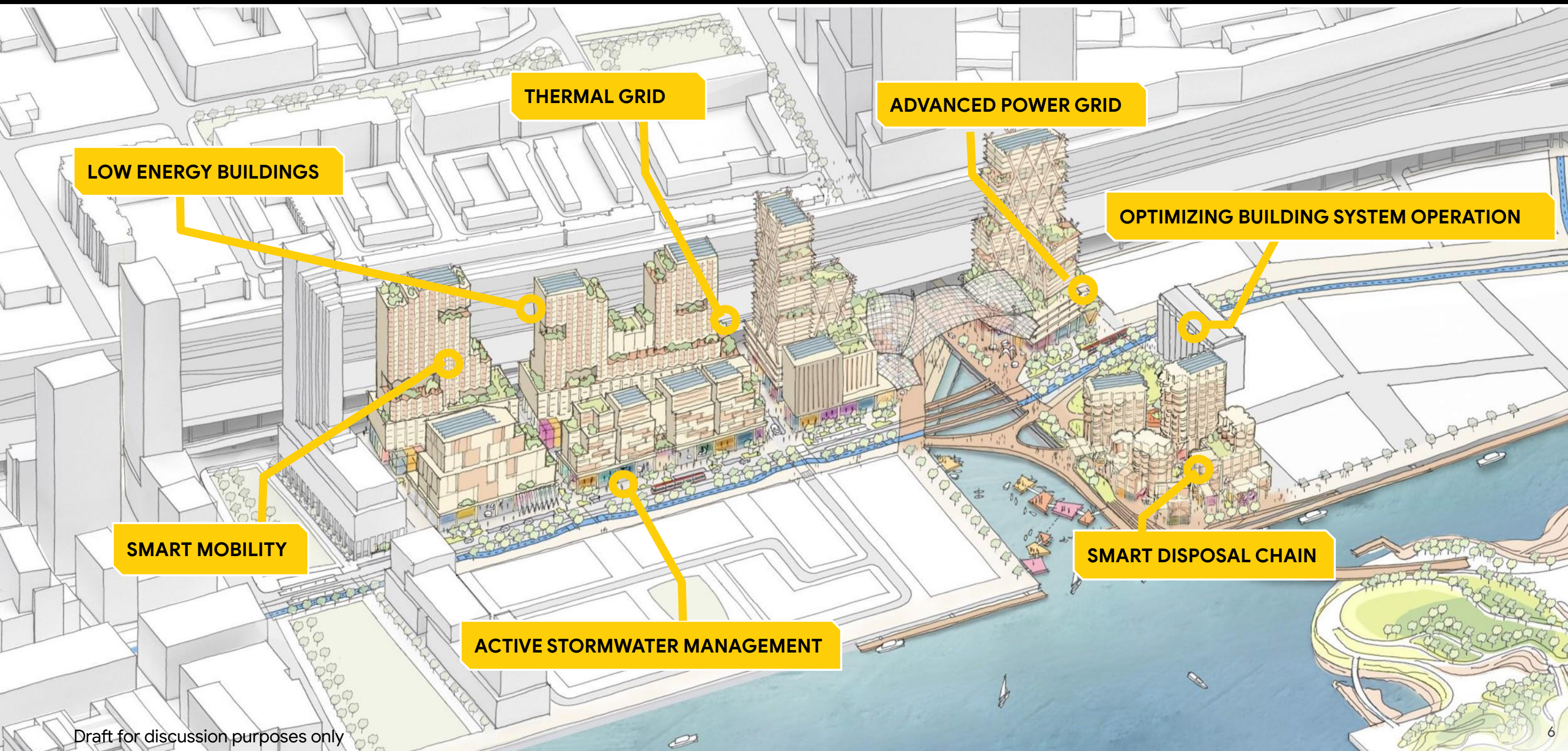


Reduce onsite GHG emissions to near zero

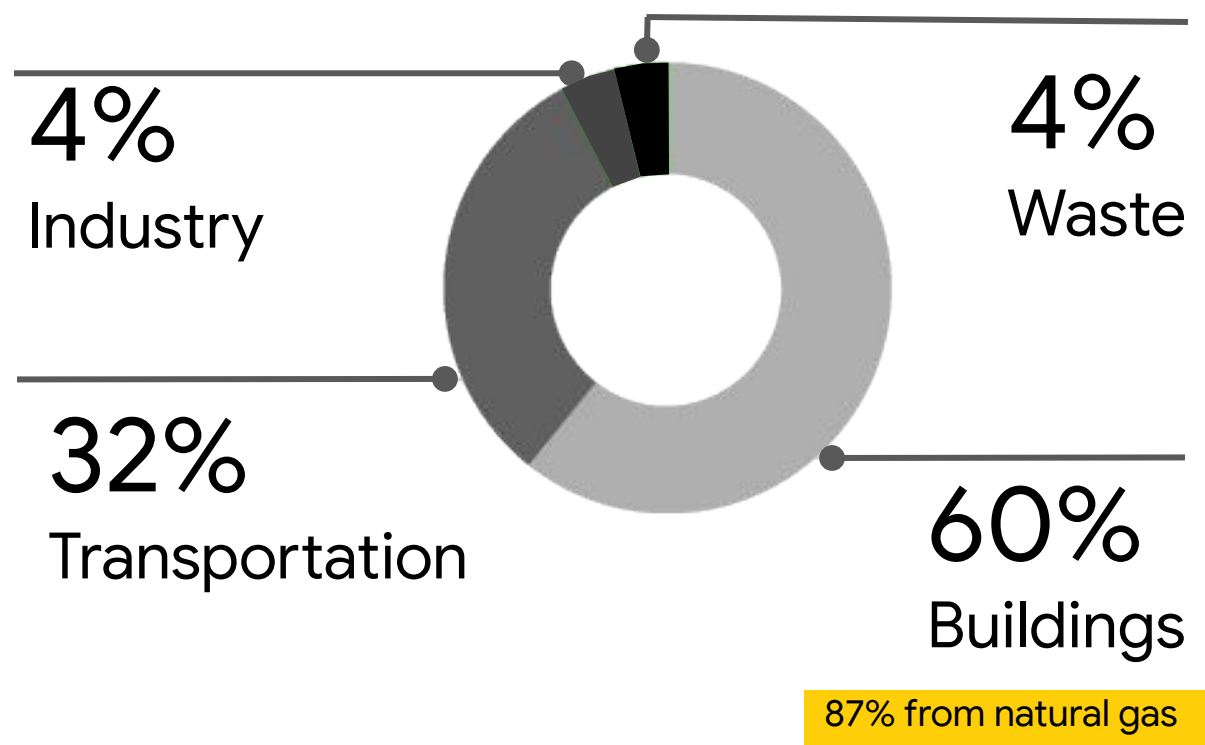


Use the development's infrastructure or technology to offset existing city emissions

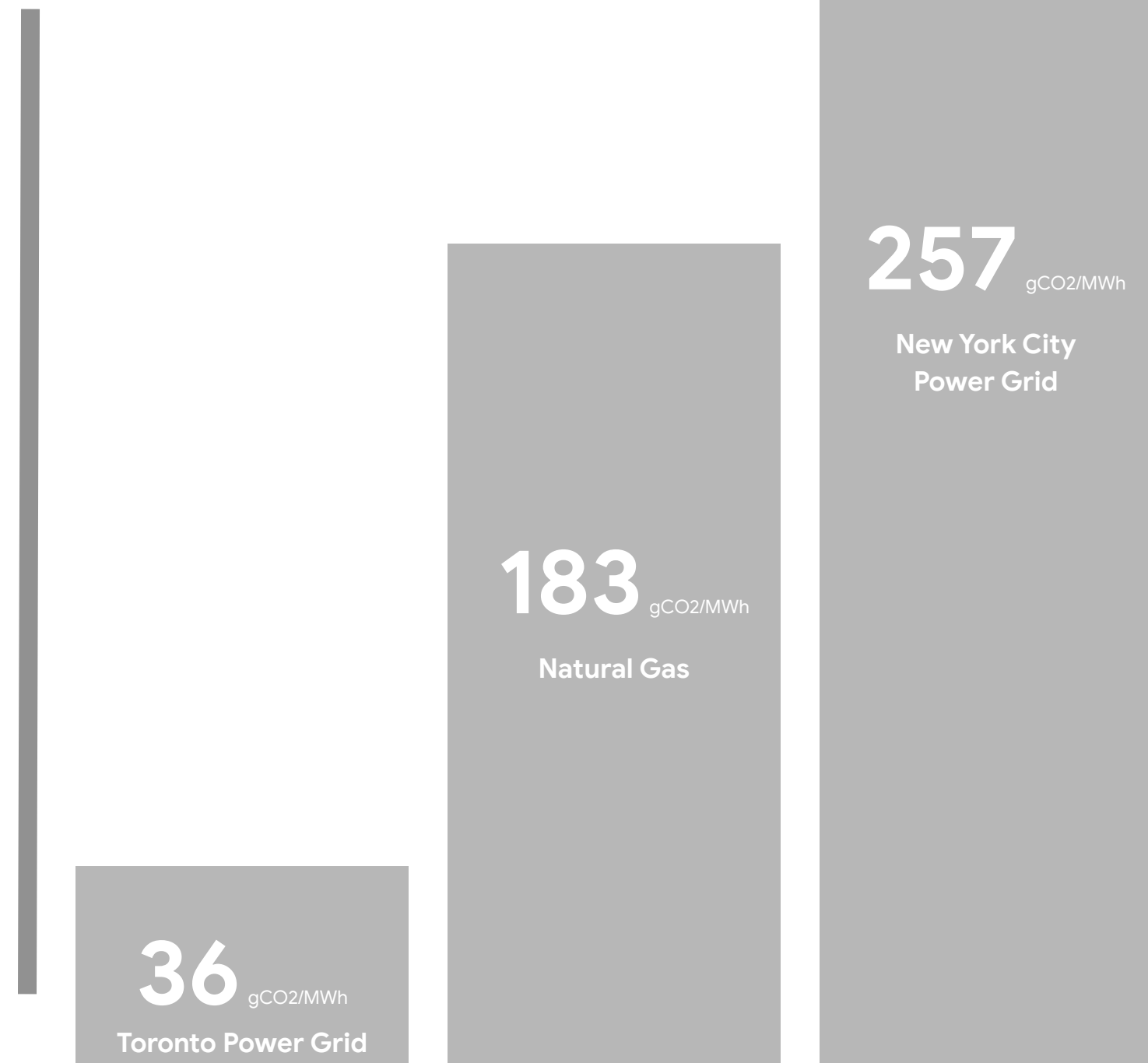
Path to climate positive - advanced systems



In Toronto, electrifying everything is a path to climate positive..



This data is compiled by the Toronto Atmospheric Fund (TAF) for the Greater Toronto and Hamilton Area (2017). TAF uses a different GHG accounting protocol than C40.



..But electrifying without reducing the load is unaffordable

5x

Price of electricity vs. natural gas,
which would increase if
electrification means new power
plants and infrastructure expansion

Published rates, Ontario. 2017

Ontario projects *unmanaged* electrification could quadruple peak demand and force new generation to be built by 2024.

For Quayside, it would double the size of our local grid.

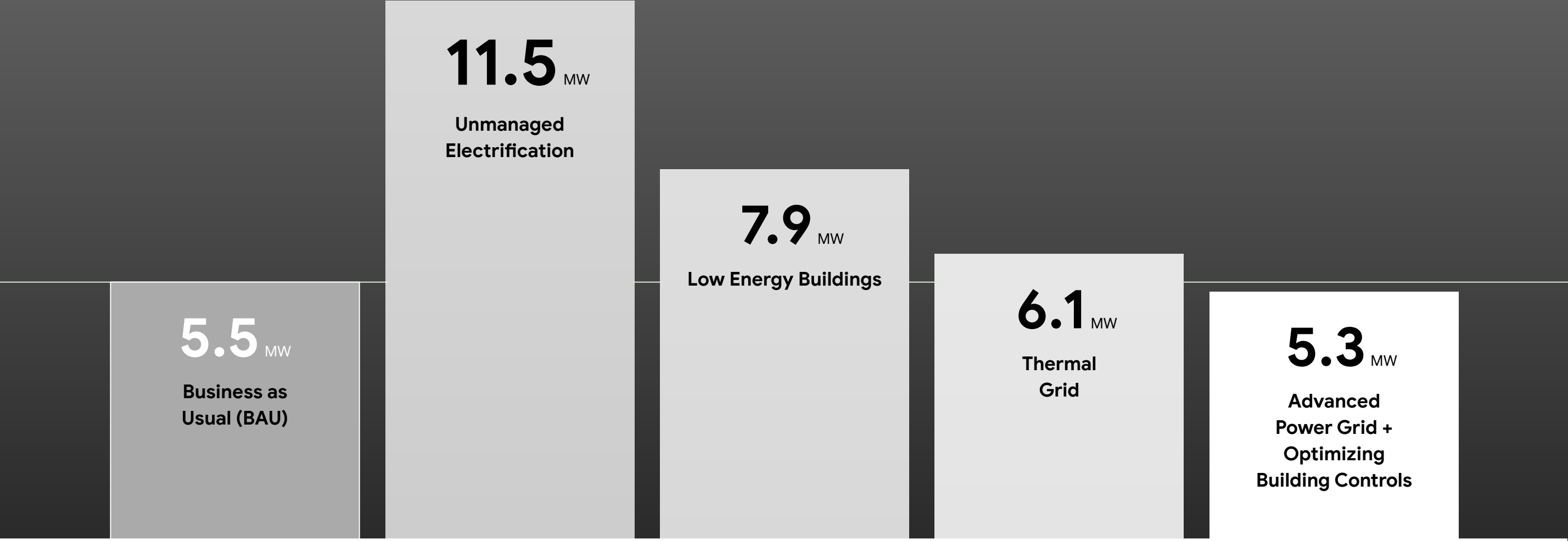
5.5_{MW}

Business as
Usual (BAU)

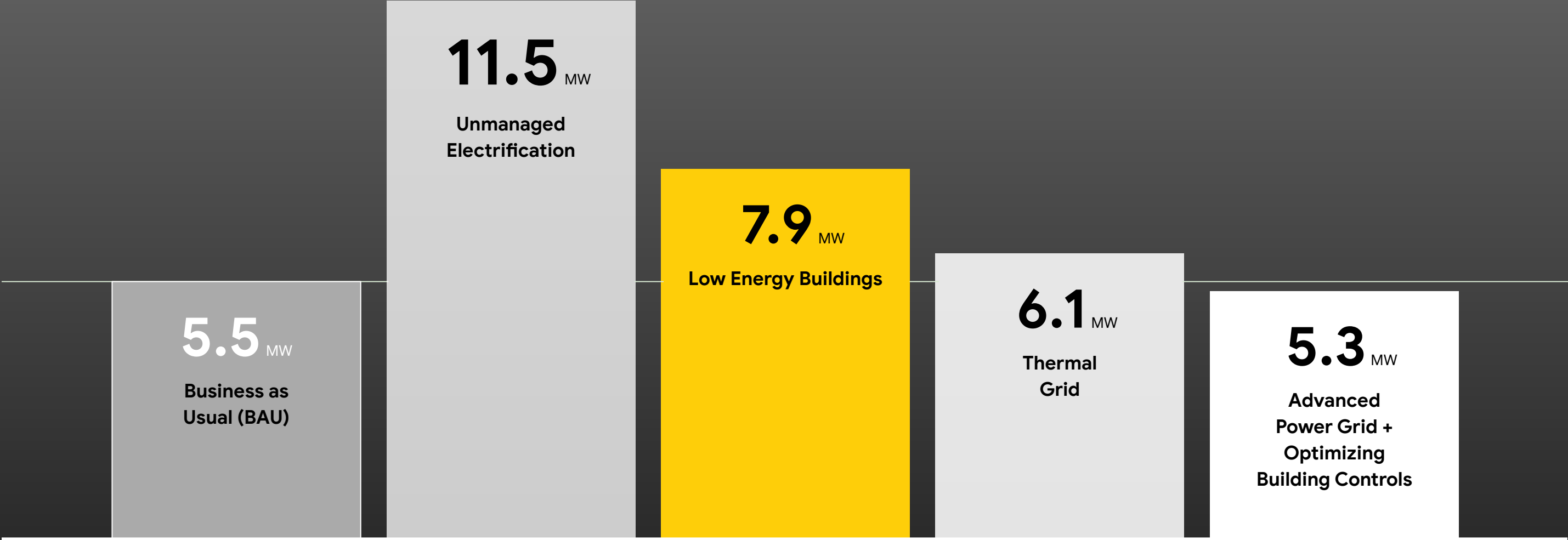
11.5_{MW}

Unmanaged
Electrification

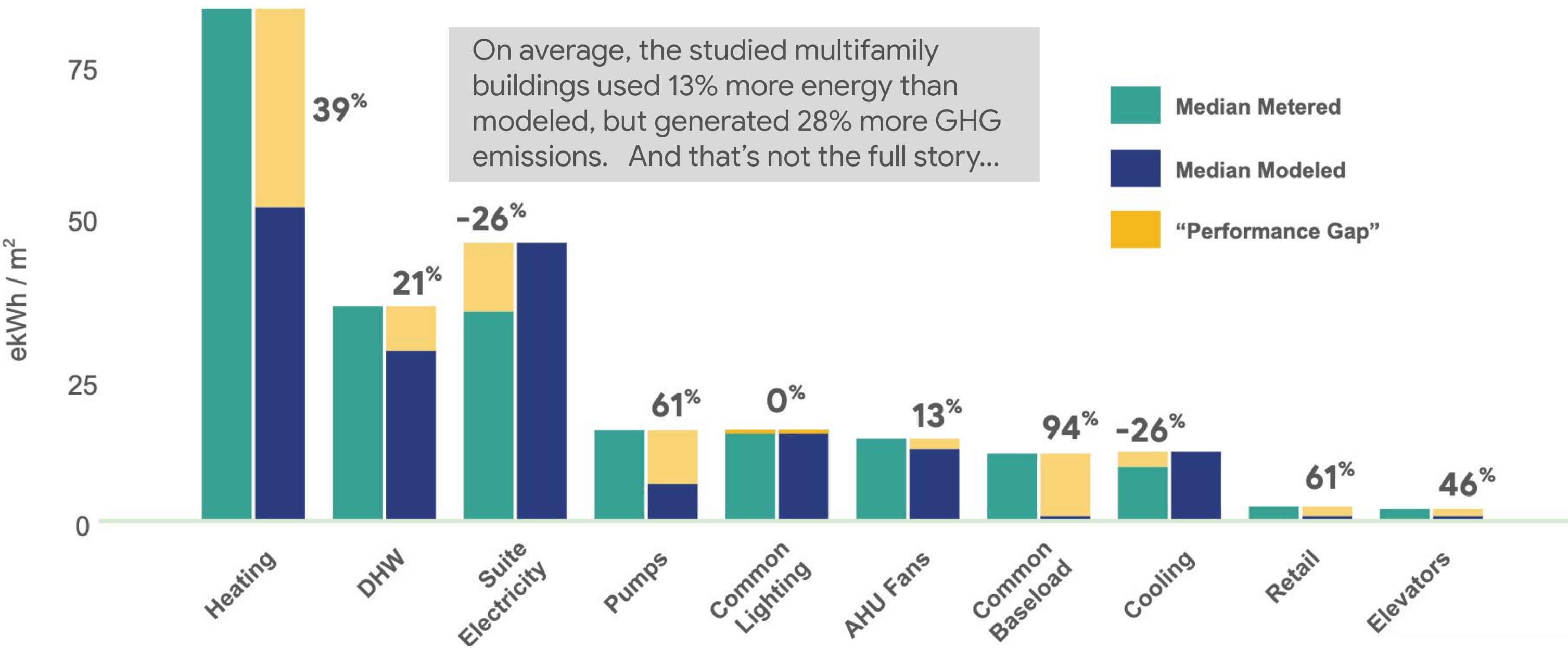
Sidewalk Toronto's path to typically-sized electrical grid



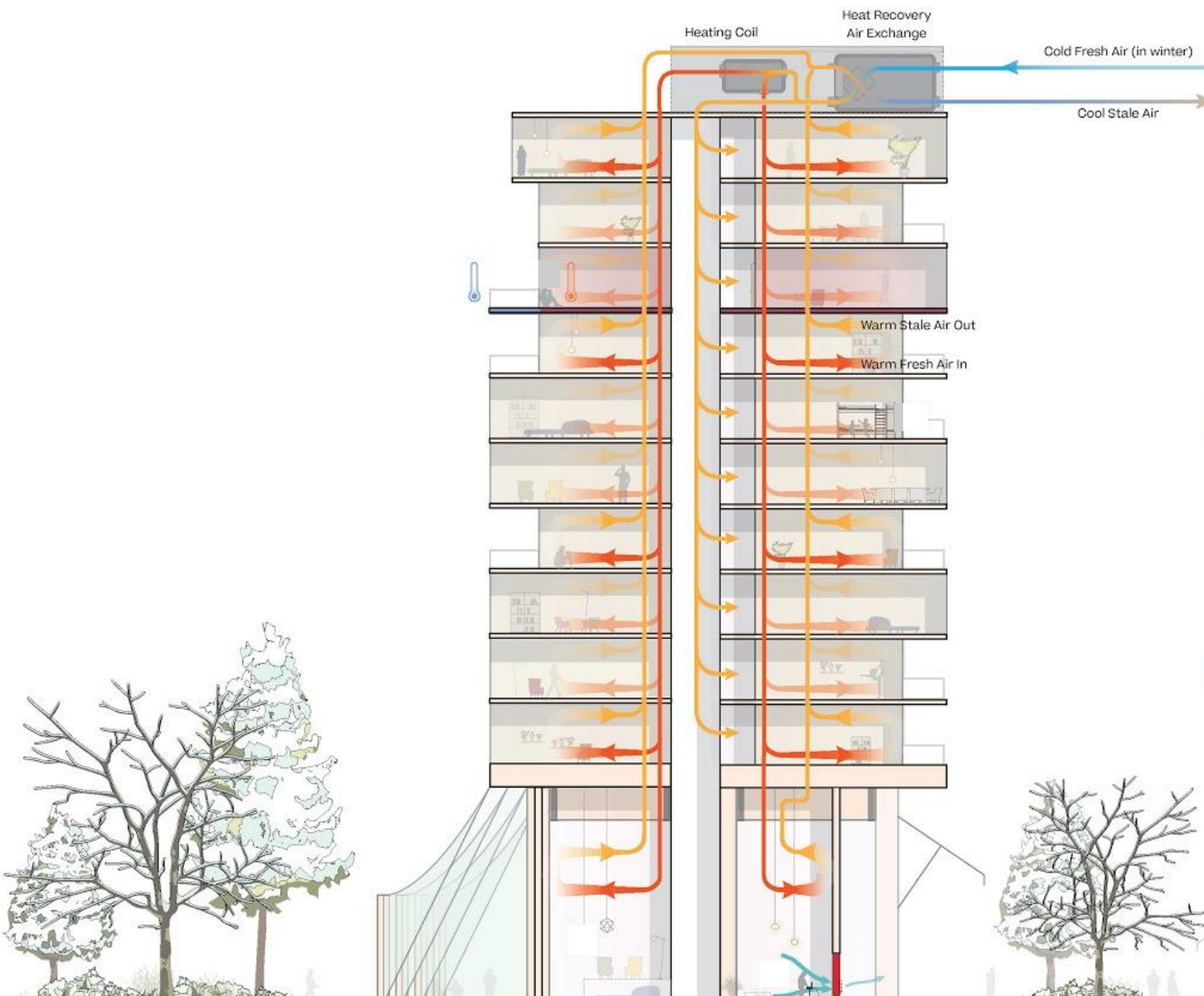
Passive House-inspired design reduces heating and cooling loads



Quantifying modelled vs. metered energy use of Toronto multifamily buildings

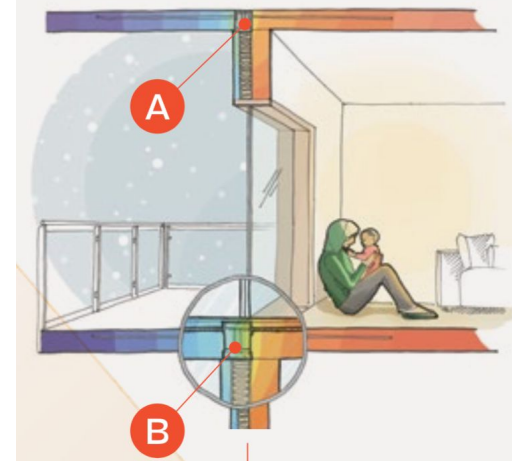


Passive House-inspired buildings: more than just the envelope



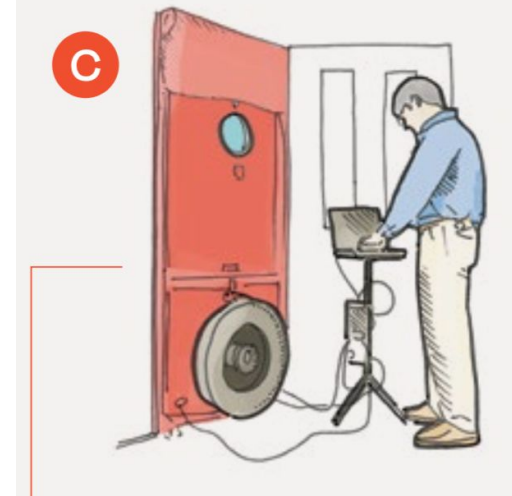
Insulation and Thermal Breaks

Carefully sized windows, adding gaskets and manufactured “thermal breaks”



Air Tightness

Blower door tested to meet compliance standards



Balanced Ventilation

Balanced supply and exhaust with ducted ventilation to all living spaces (incl. bedrooms)



Buildings will meet cutting edge performance goals



- **Assessment type**

- **Representative model:** LEED and Code
- **Performance data:** Toronto Green Standard (TGS) and Passive House

- **Update Frequency**

- Updates **every 4 years**, gradually increases energy and emissions performance requirements over time

- **Exporting to other cities**

- City of **Vancouver** is a notable leader in the recent implementation of their Zero Emissions Buildings Plan.

Factory-based mass timber buildings

Faster Build Times

Less on site construction time due off-site prefabrication

Digital Design

Coordination of construction and operation managed digitally

Improved Sustainability

Mass timber structures generate 1/10th the amount of carbon vs. concrete equivalents, sequester carbon, and produce less construction waste due to factory's economy of scale

Reduced Costs

Up to 10% cheaper than other structural options and trending to become less expensive in many markets

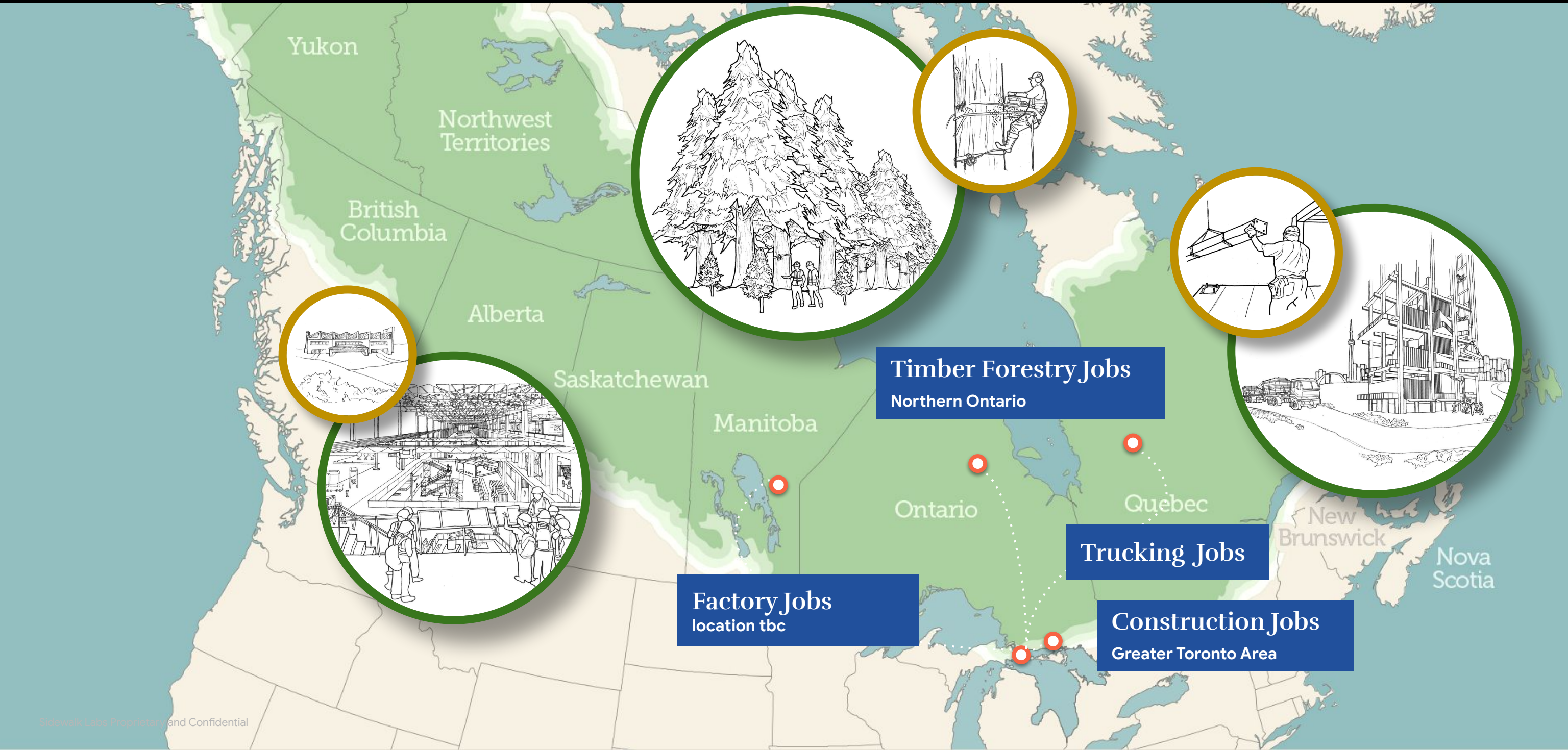
Targeting Cradle to Cradle®

Shikkui plaster (lime and plant fiber), floor materials and tall timber

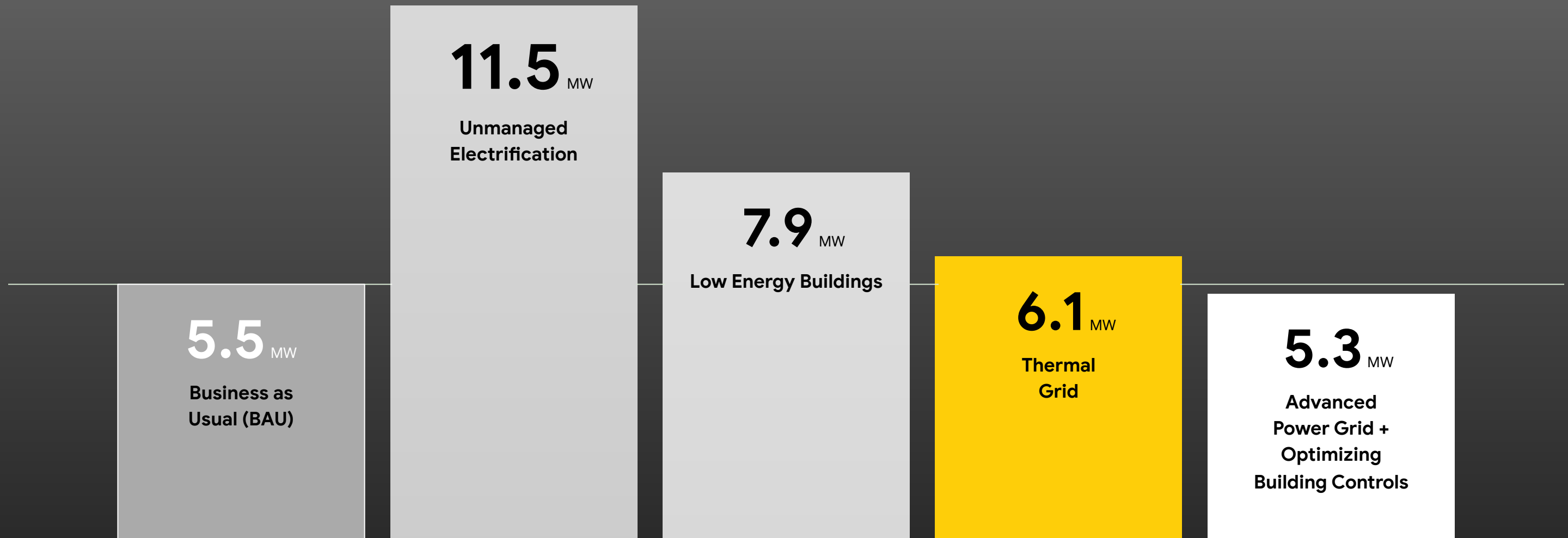
Biophilic Design

Creating spaces that evoke nature, because it promotes wellness

Sustainable supply chain that supports local industry



Thermal grid reduces grid size to 6.1 MW



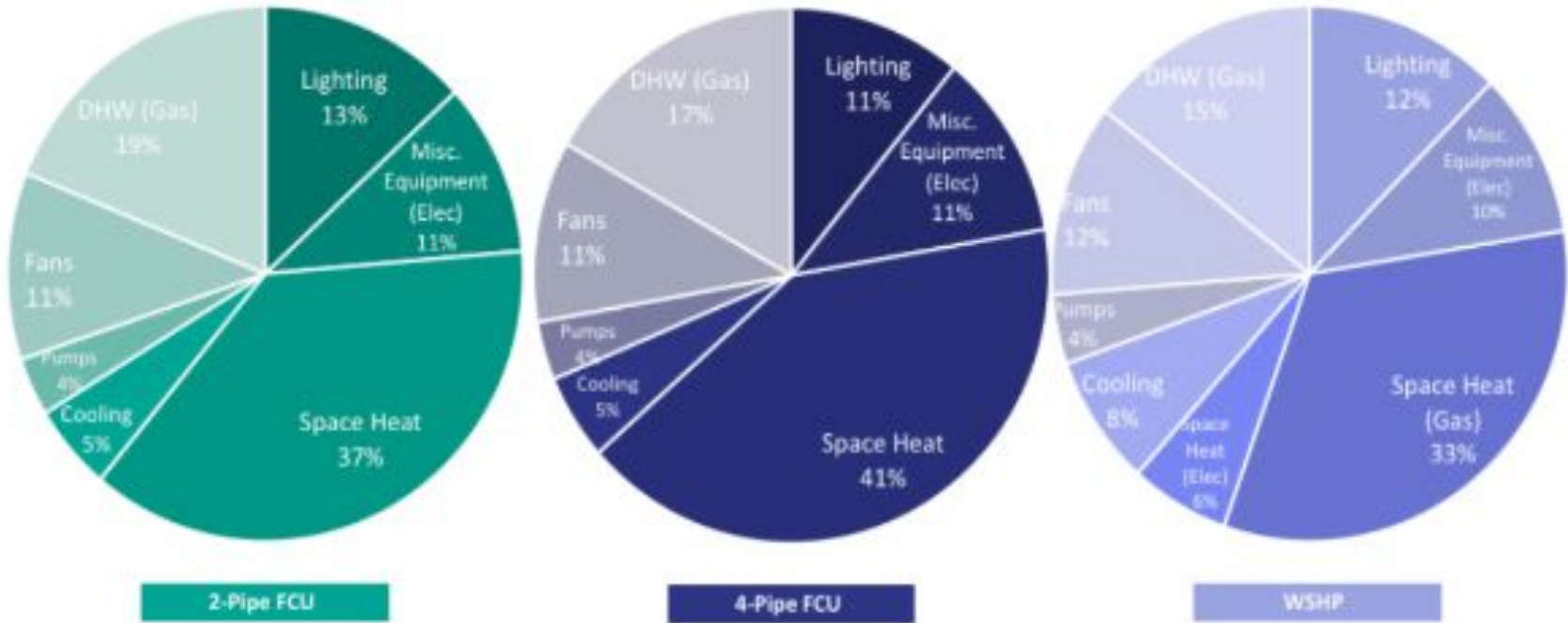
The challenge of heating without fossil fuels



Sidewalk Labs study to quantify the “Performance Gap” - the difference between **modeled** energy use and **actual** energy use

The study of Toronto MURBs found that buildings with water source heat pumps use nearly as much gas as those with traditional hot water heating.

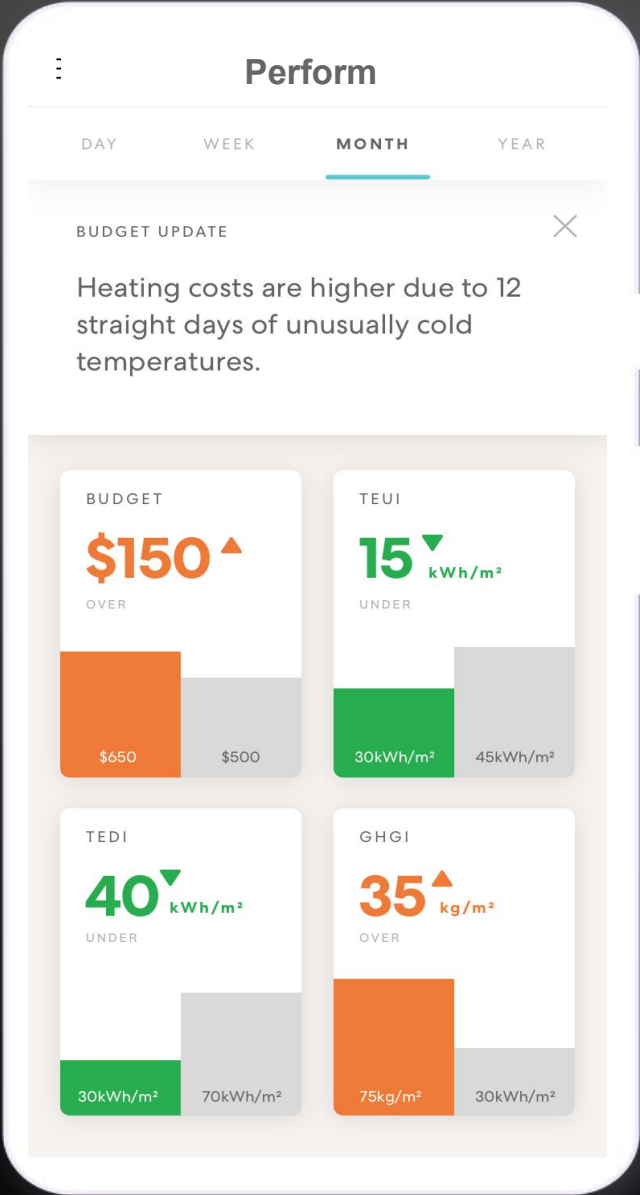
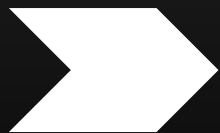
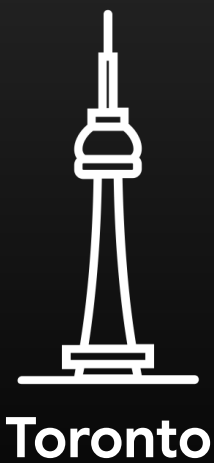
Learning: Heat pump loops require considerable tempering, most often provided by boiler fed hot water.



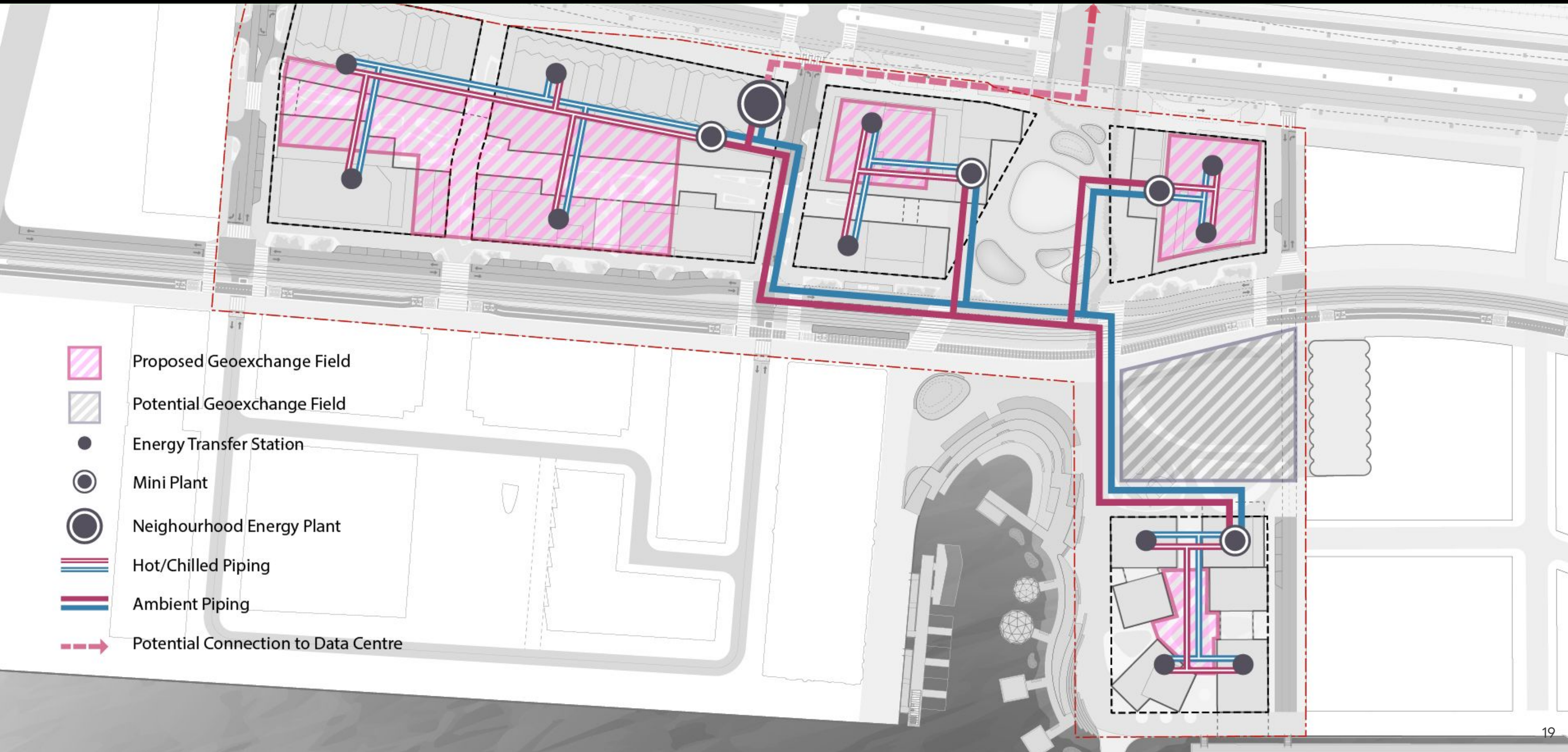
End use energy breakdown of Toronto MURBs, categorized by HVAC system type.

A tool to enable outcome based codes

- Stagnant targets → dynamic targets
- Data on energy use, occupancy, weather, etc → dynamic maximum EUI, TEDI and GGI metric for buildings

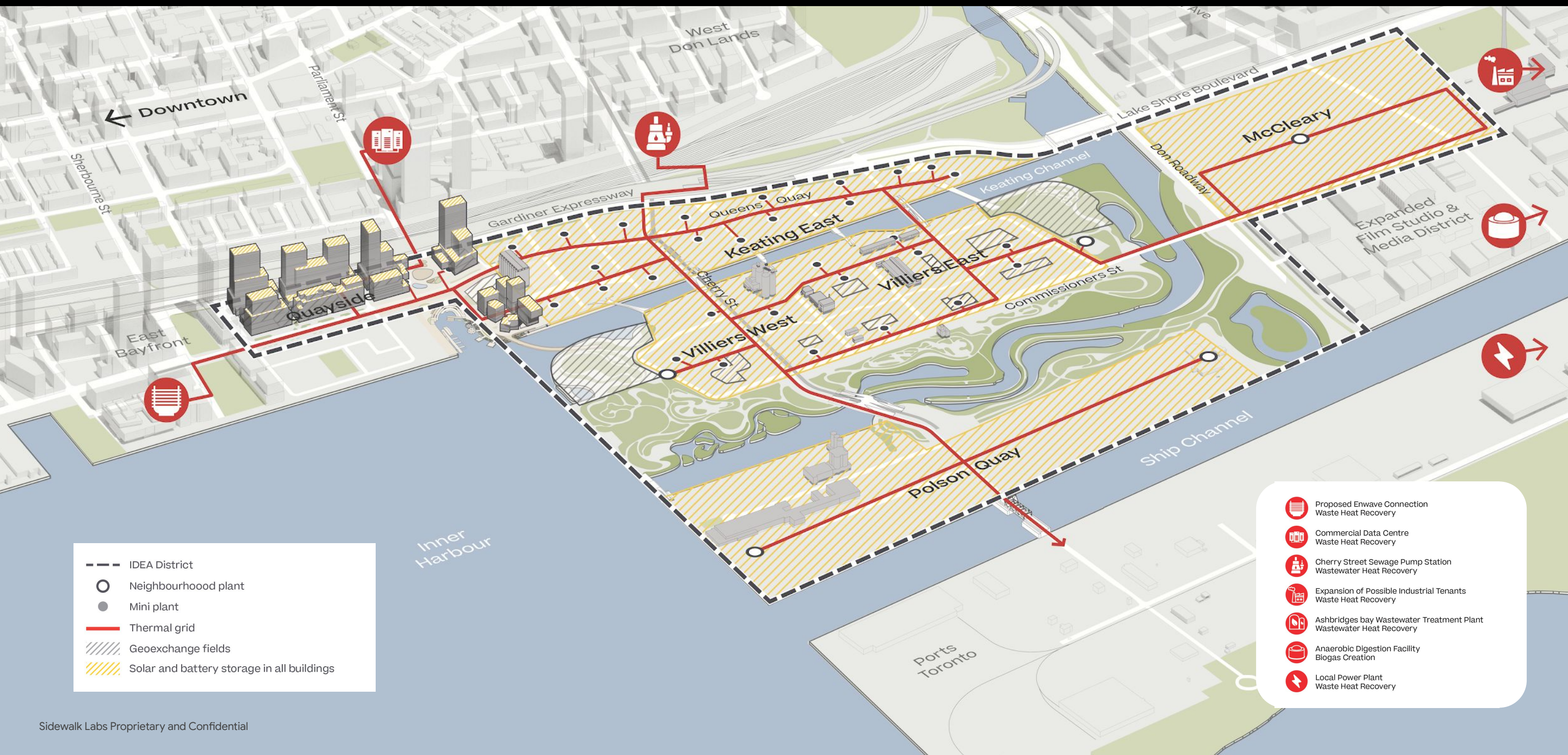


Heating and cooling at Quayside: geothermal wells and sewer heat

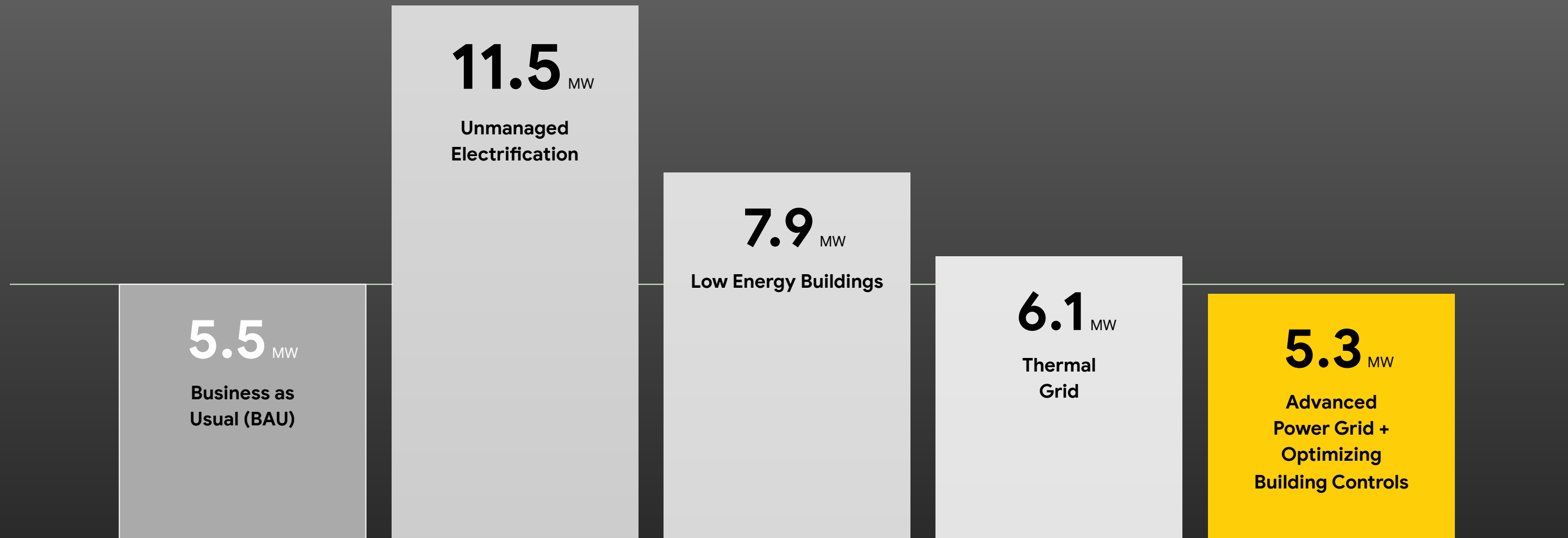


THERMAL GRID

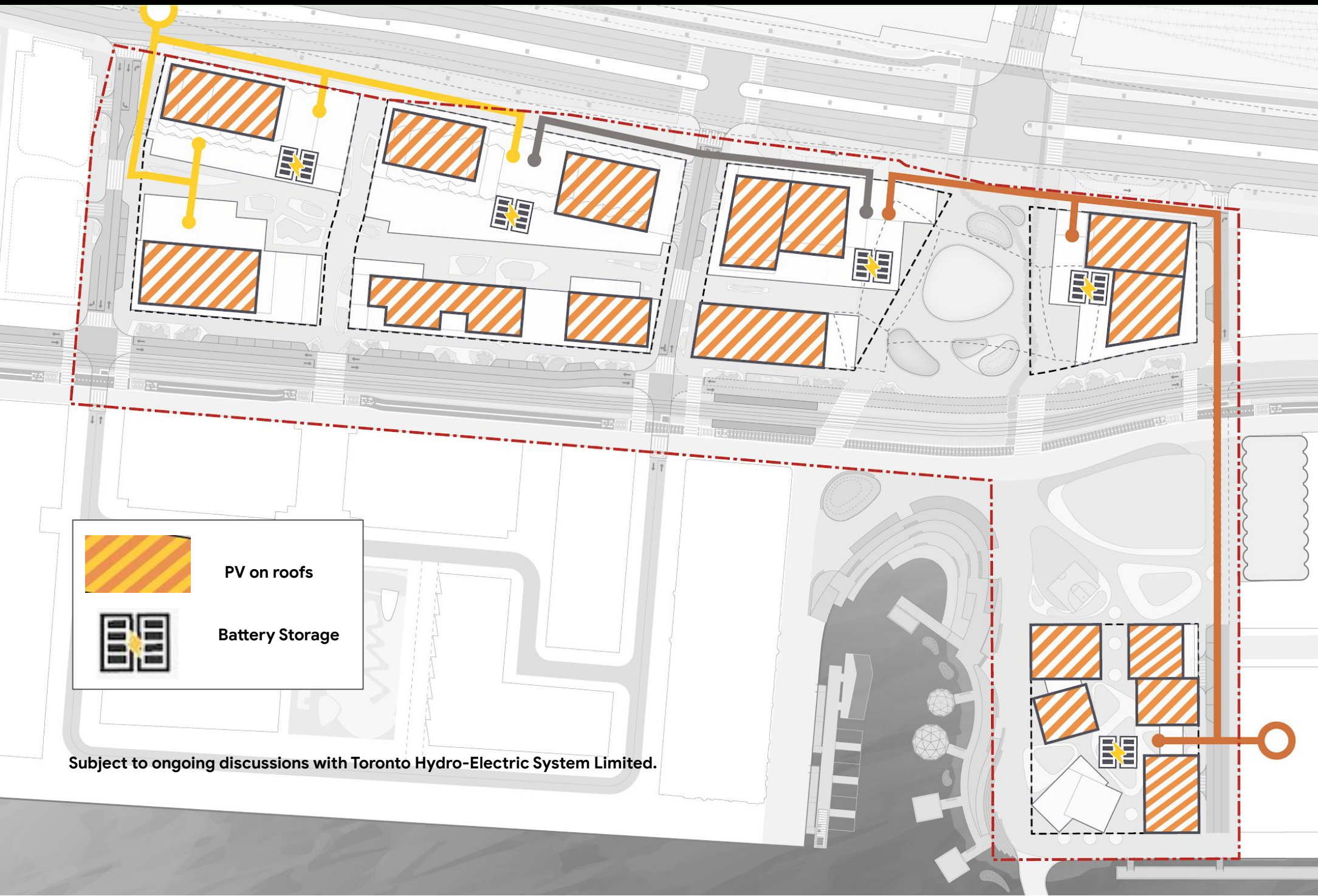
At scale, thermal grid could connect to other resources and export clean energy



Advanced power grid reduces grid size to business as usual with PV + battery + automated demand response



Quayside Plan: Designed for rate pilots, resiliency, & islanding capabilities

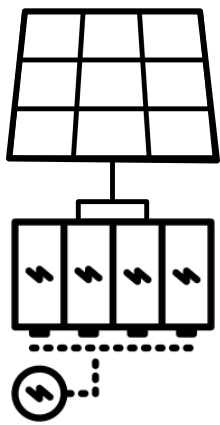


- **Served by two independent substations**, each with the ability to serve the entire neighbourhood
- **Designed for islanding of the neighbourhood and individual buildings** to allow use of onsite resources during a power outage
- **On-site energy resources** include solar PV and biodiesel emergency generators, supplemented by battery storage

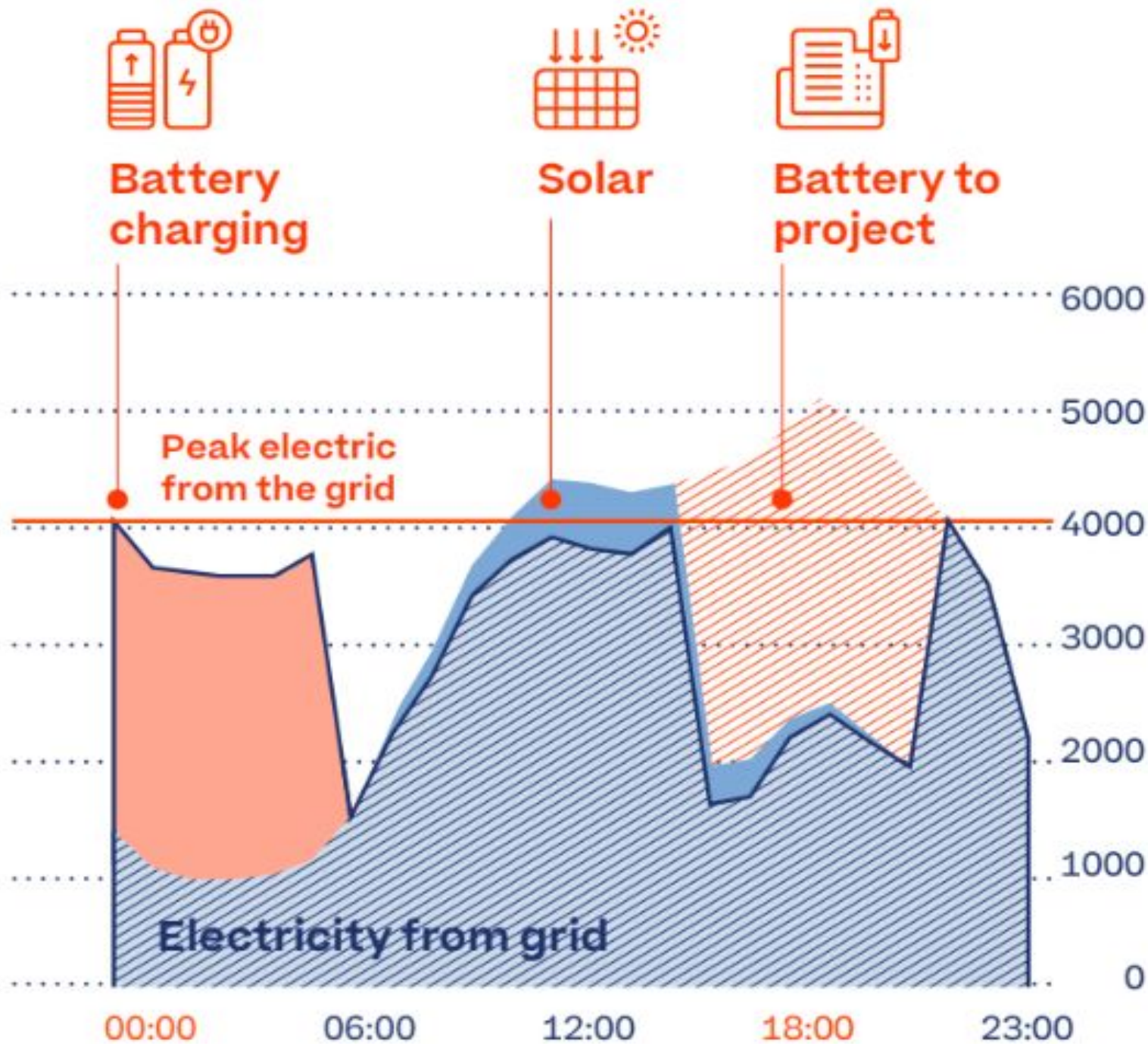
Energy will be priced to reflect real time GHG intensity



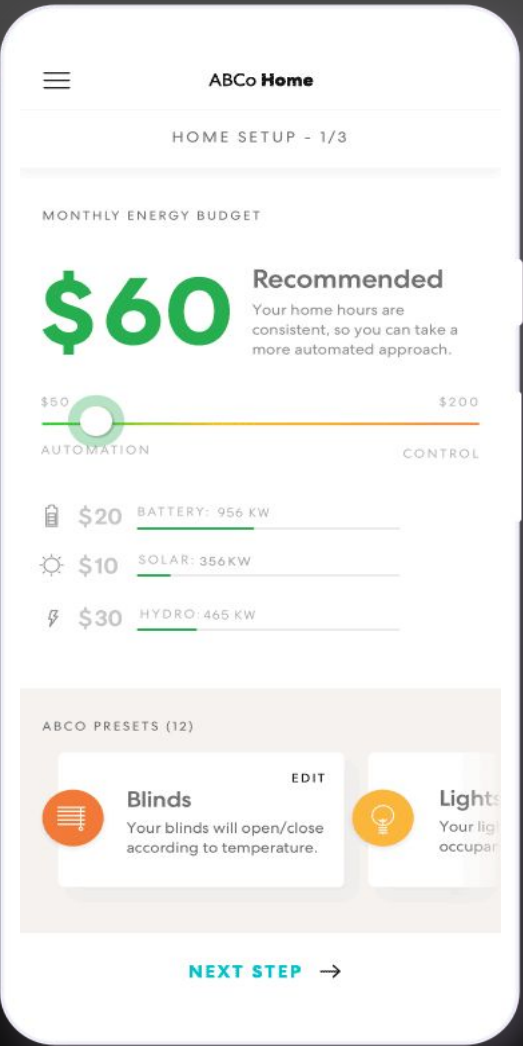
Dynamic Rate Engine” Exposing customers to the hourly cost of electricity generation and demand



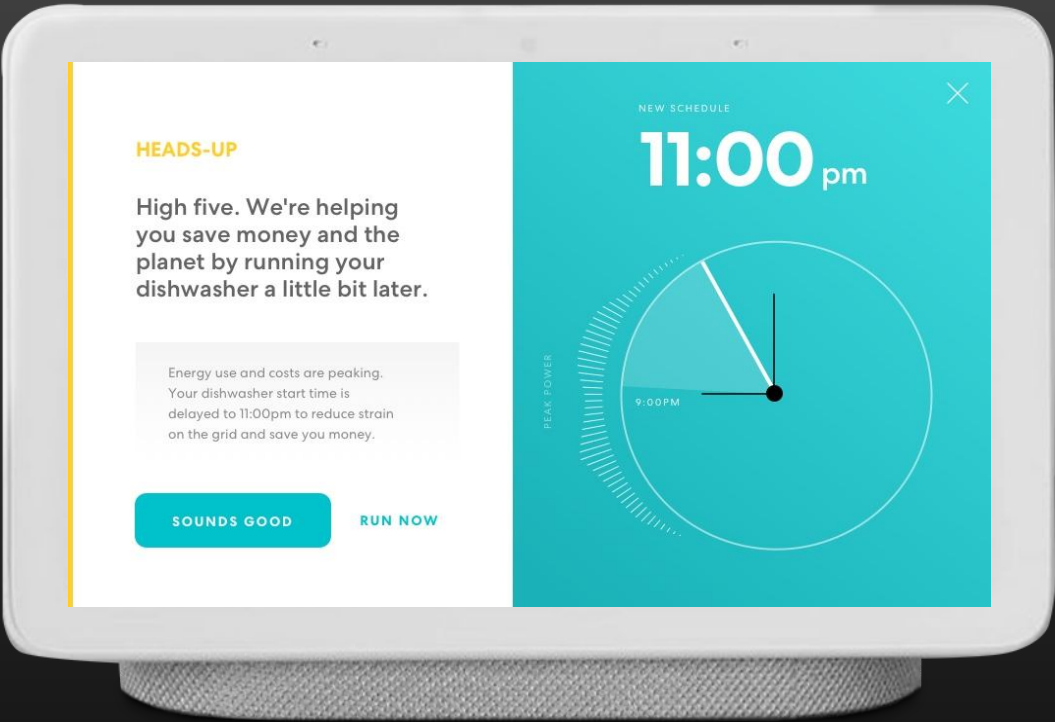
Solar and battery transaction platform: Pricing and allocating shares of solar and batteries to customers; offering insulation from highest-priced power



Sidewalk Labs' vision to give residents the utility cost that they choose



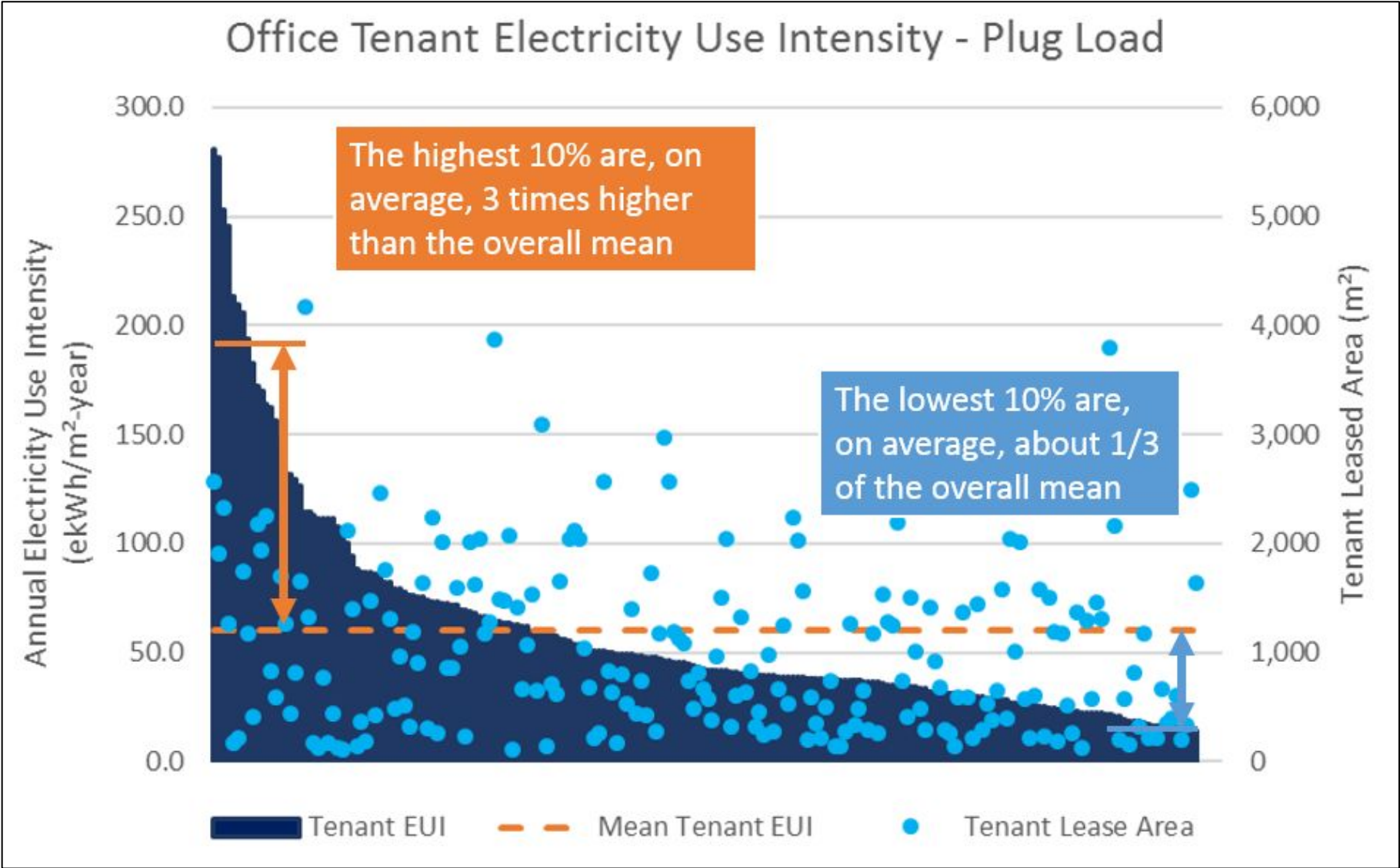
Smart Adjustments



Home Scheduler:

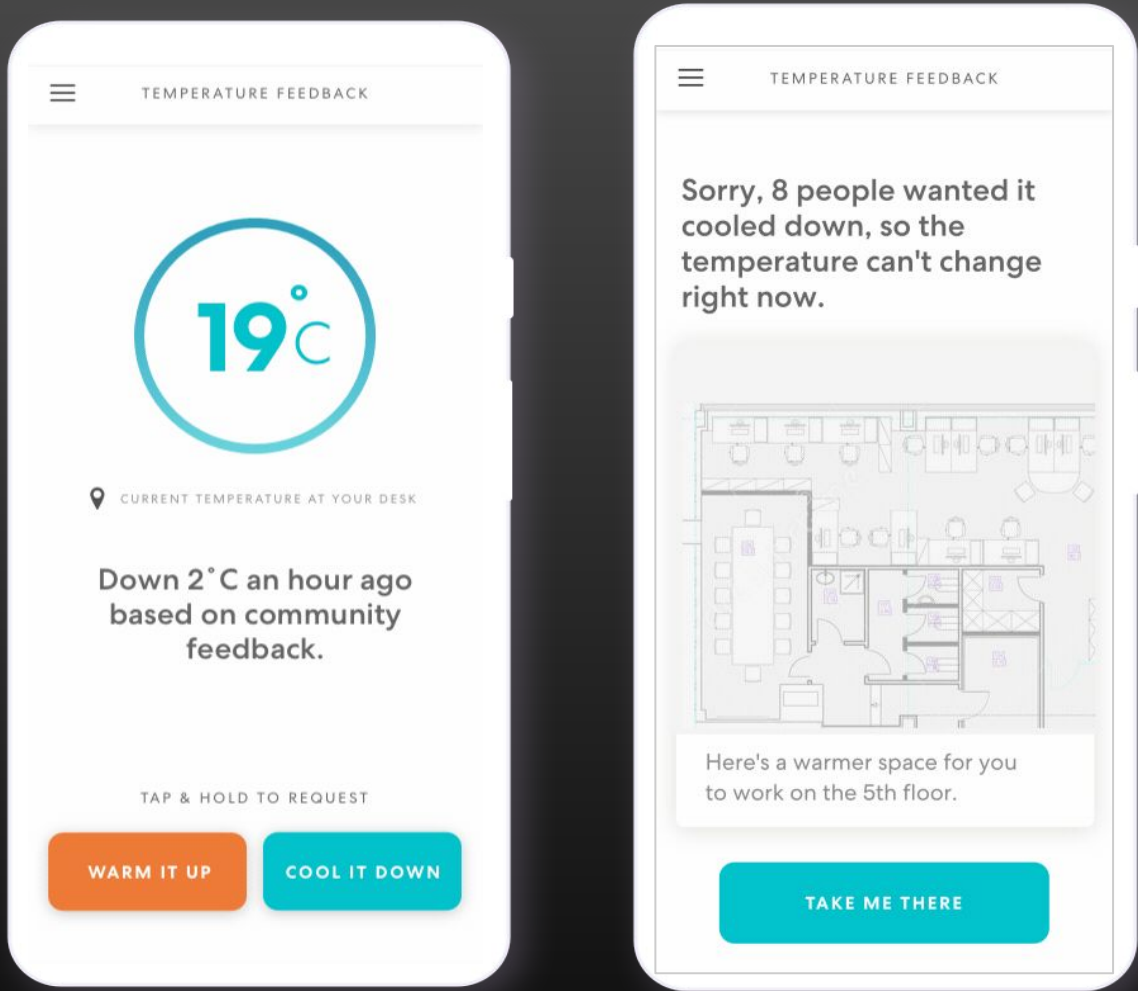
- Integrates smart thermostats and Smart Grid enabled appliances
- Offers solar PV and battery share purchase recommendations
- Allocates central heating and cooling costs to residents based upon their time of use
- Enables residents to set their utility bill cost and adjusts home accordingly

Study: Realizing the extent of commercial tenant energy waste



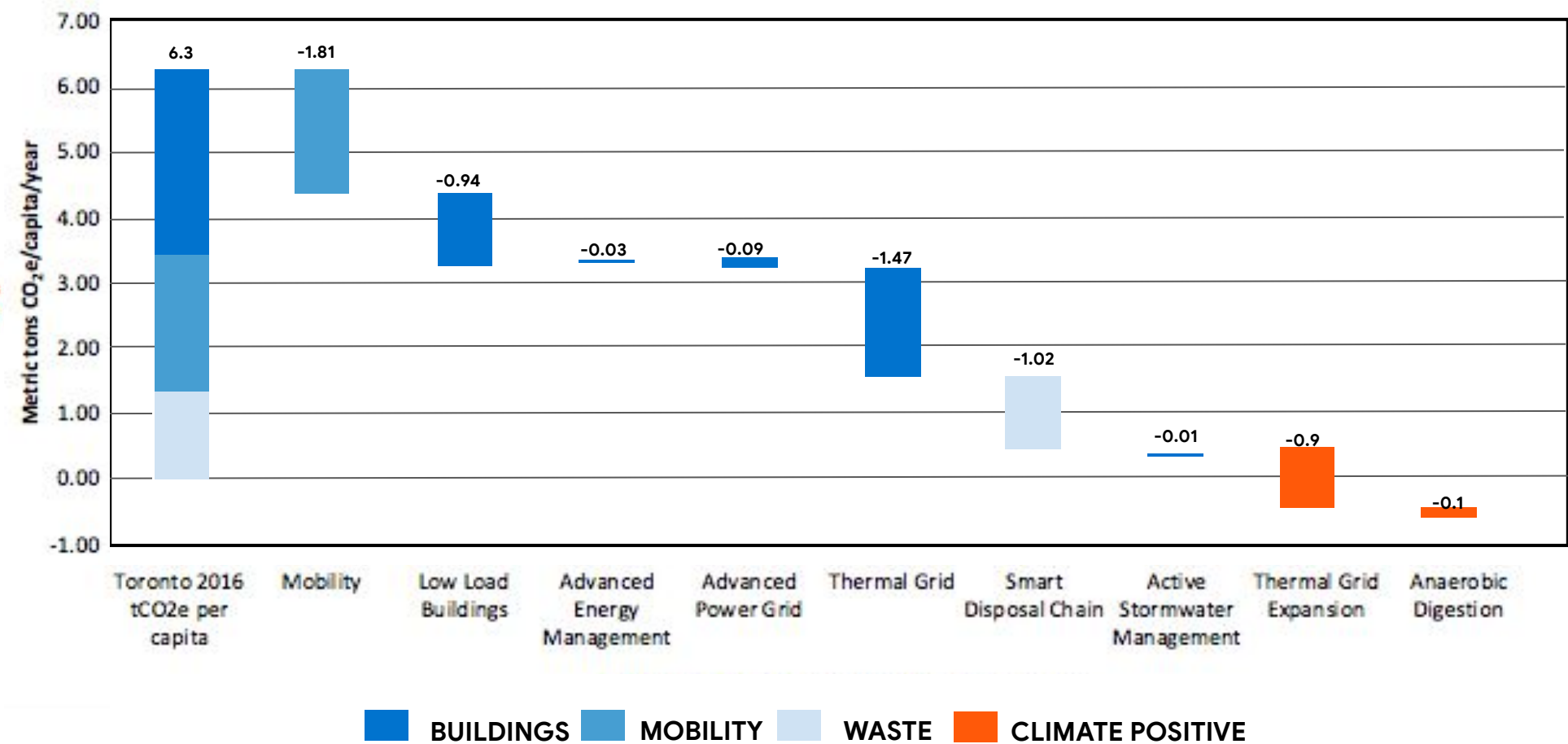
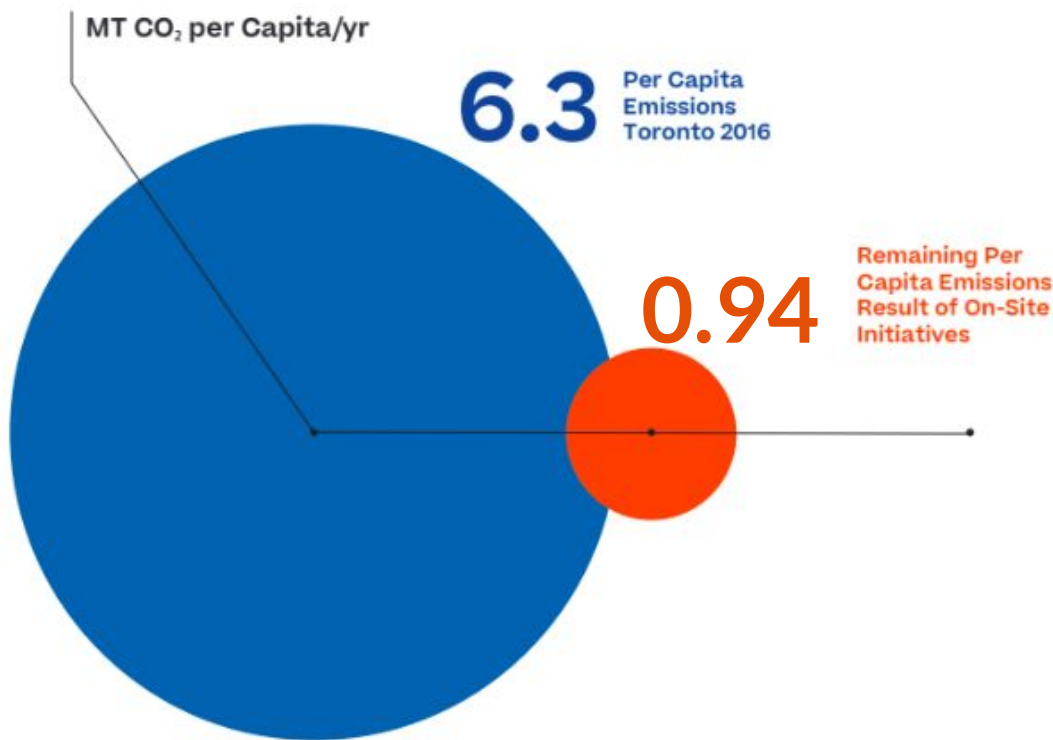
In-suite office electricity loads (plug loads and lighting) for approximately 75 sub-metered tenants in Toronto office buildings.

Sidewalk Labs' vision to eliminate energy waste in commercial buildings



Enabling workers to conveniently communicate their comfort preferences and receive direct feedback on how their preferences can be met.

Quayside Progress: >85% GHG reduction from current emissions



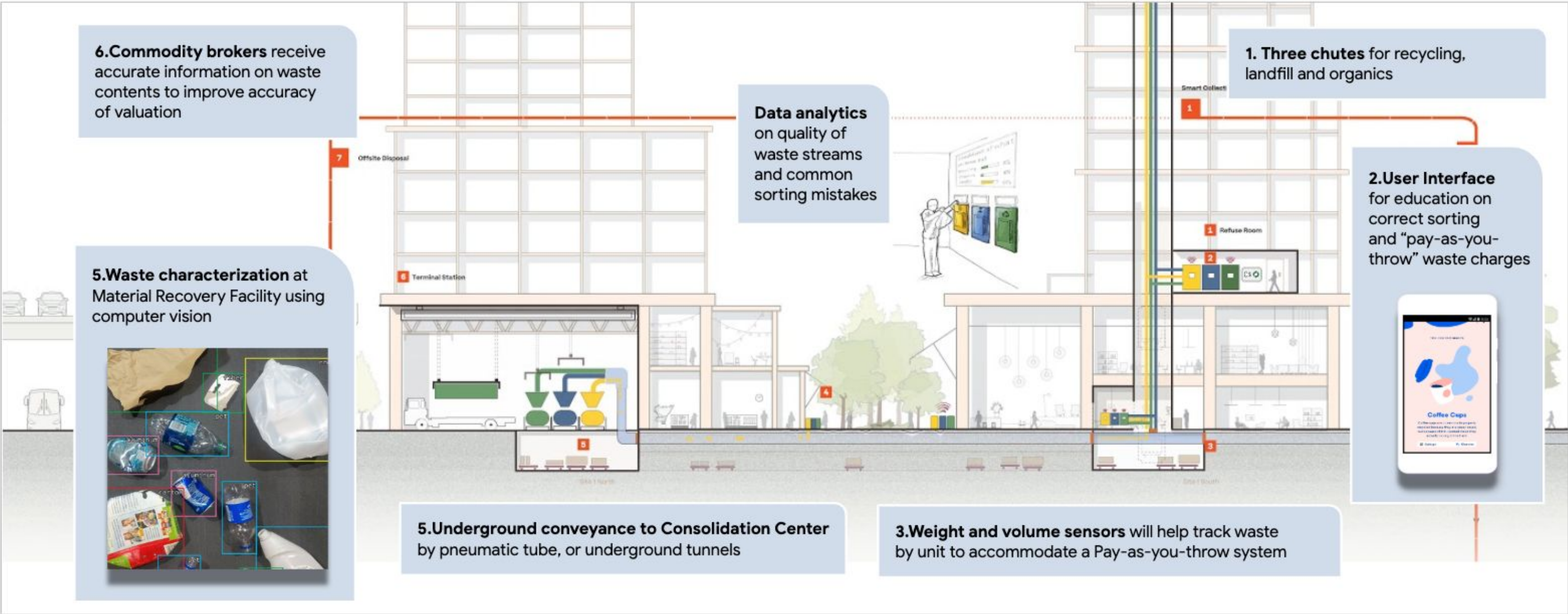
Getting over the finish line

Tapping the full potential of wastewater from Ashbridges Bay would enable the project to give back 70,444 annual tonnes of CO₂, or nearly 0.9 tonnes per person. Sidewalk Labs could achieve an additional 0.1 tonnes per capita offset through the creation of biogas from anaerobic digestion.

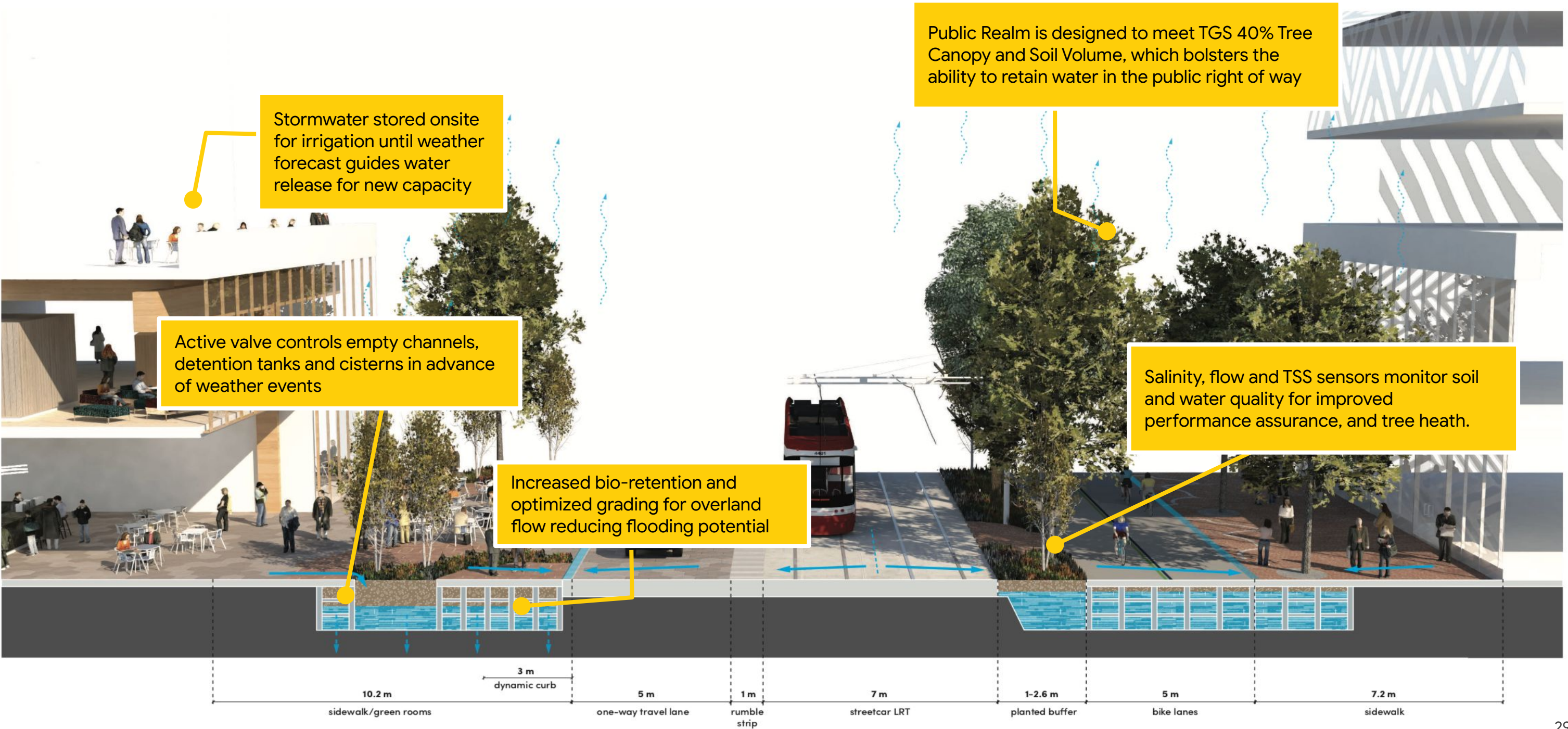
-0.89

Sidewalk Toronto's path to 80% waste diversion from landfill

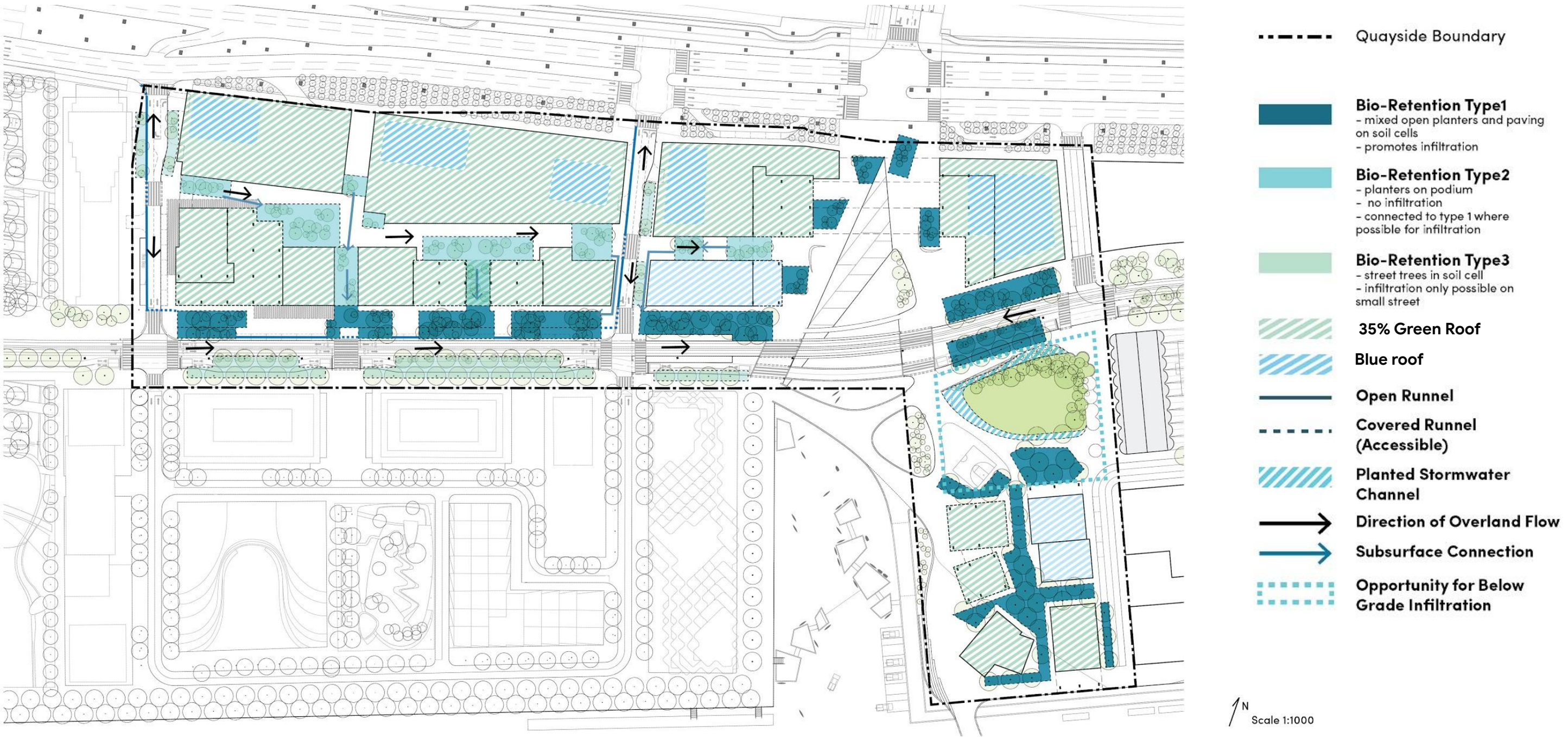
Currently, just 27% of Multi-Unit Residential and 17% of Commercial building waste is diverted from landfill in Toronto.



Green infrastructure uses monitoring to measure performance and predict flows



Combination of green roofs and blue roofs for detention and retention



Thank You