

# Planning and Financing Corporate Decarbonization



# Purpose

To share one community's corporate decarbonization costing study to help other cities advance their own work.





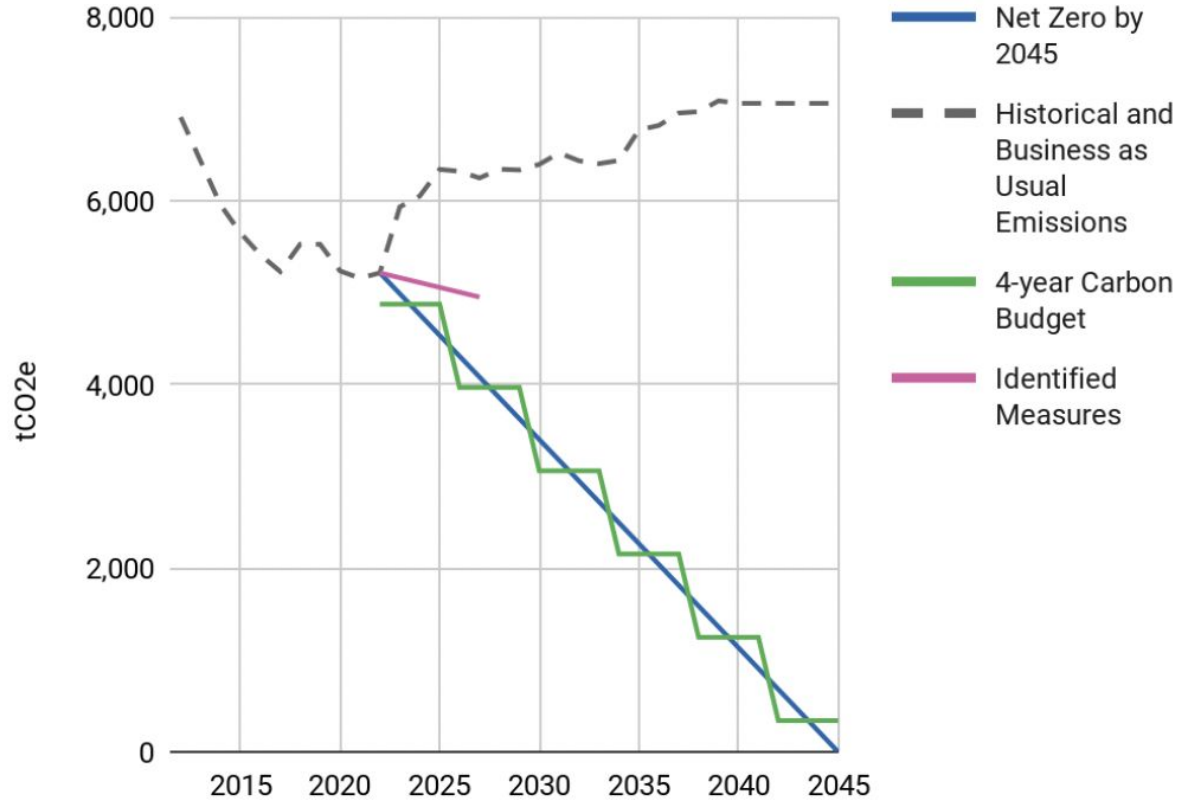
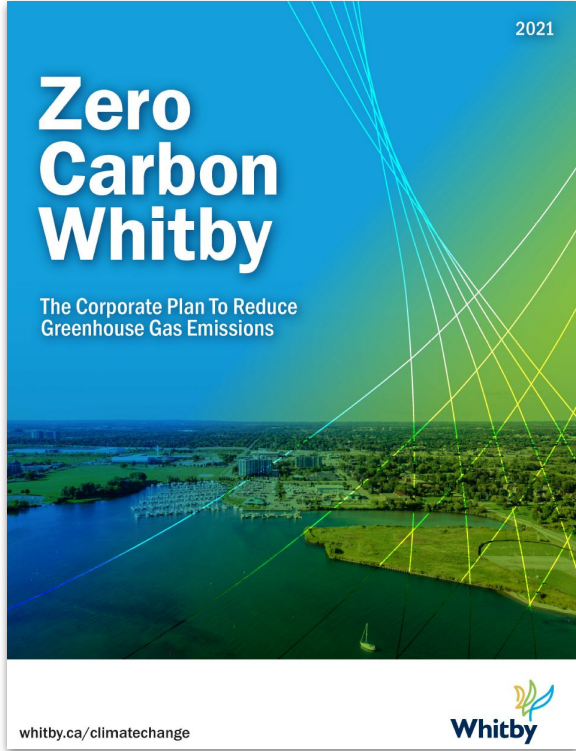
# Summary: Zero Carbon Whitby Results

# Strategy



Decarbonize the town's buildings, fleet, and lighting on a schedule that aligns timing closely to existing asset management plans, known funding constraints, and the community's existing decarbonization goals. These goals were:

- Reach net zero by 2045.
- Stay within the Town's carbon budget.





## Scope

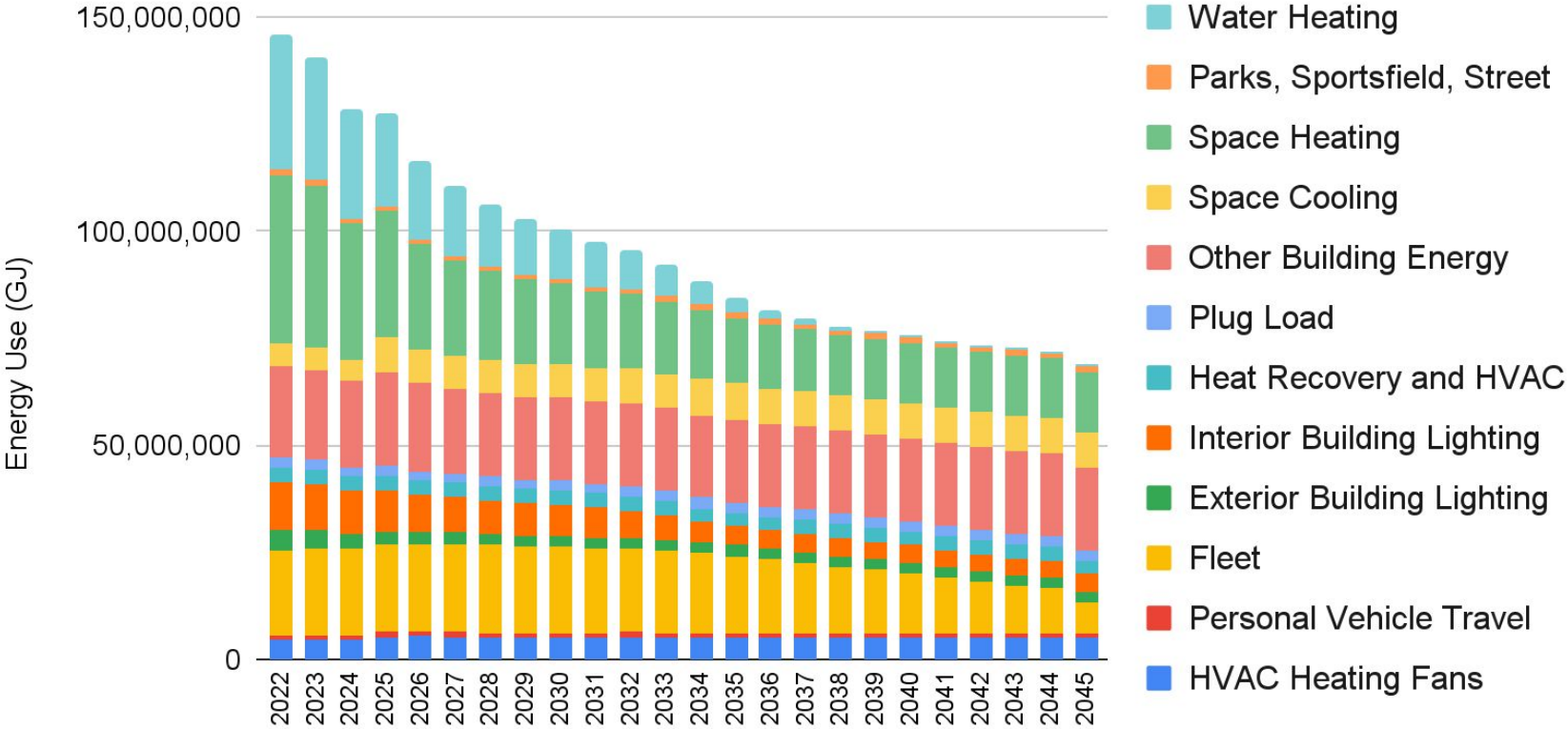
- 63 buildings
- 222 vehicles or equipment
- 19,000 street, traffic and sports field lights

## Annual Emissions

- 2019 = 5,525 tonnes

# Energy Use Results

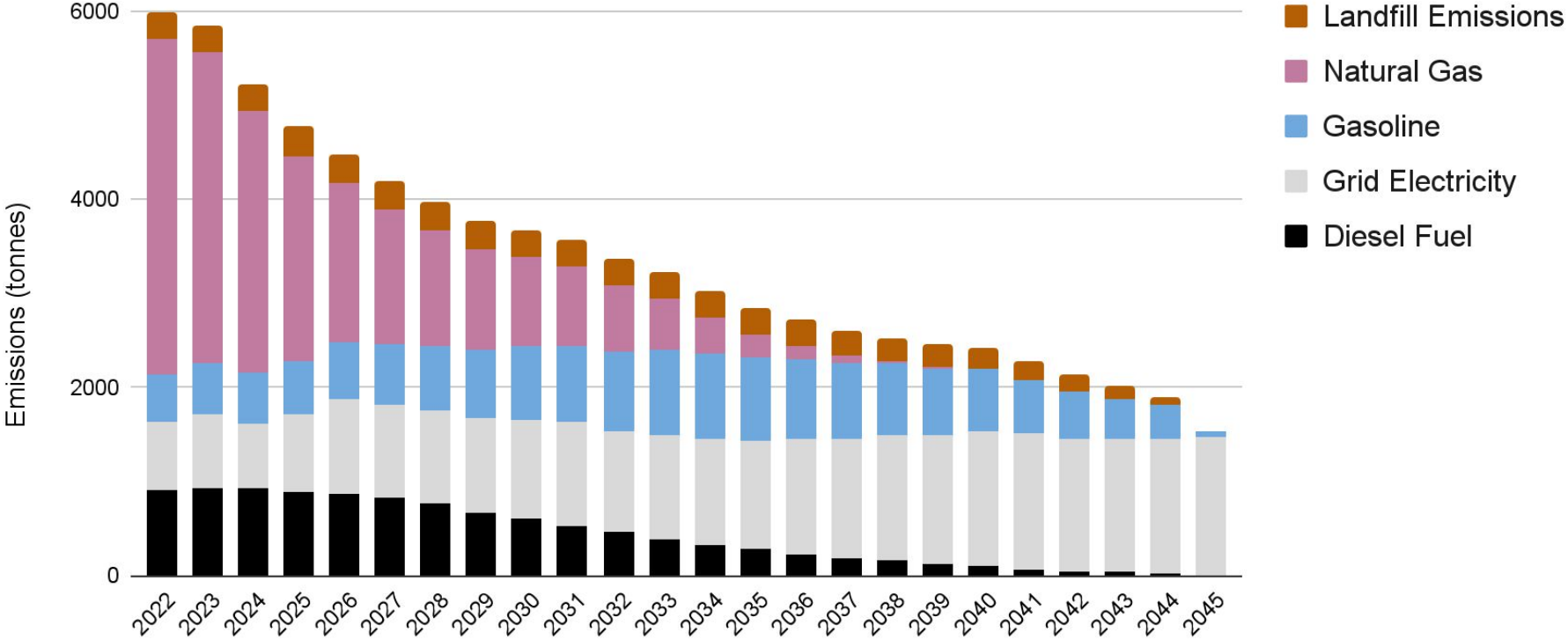
# Energy Use in ZC Whitby





# Emissions Results

# Emissions in ZC Whitby



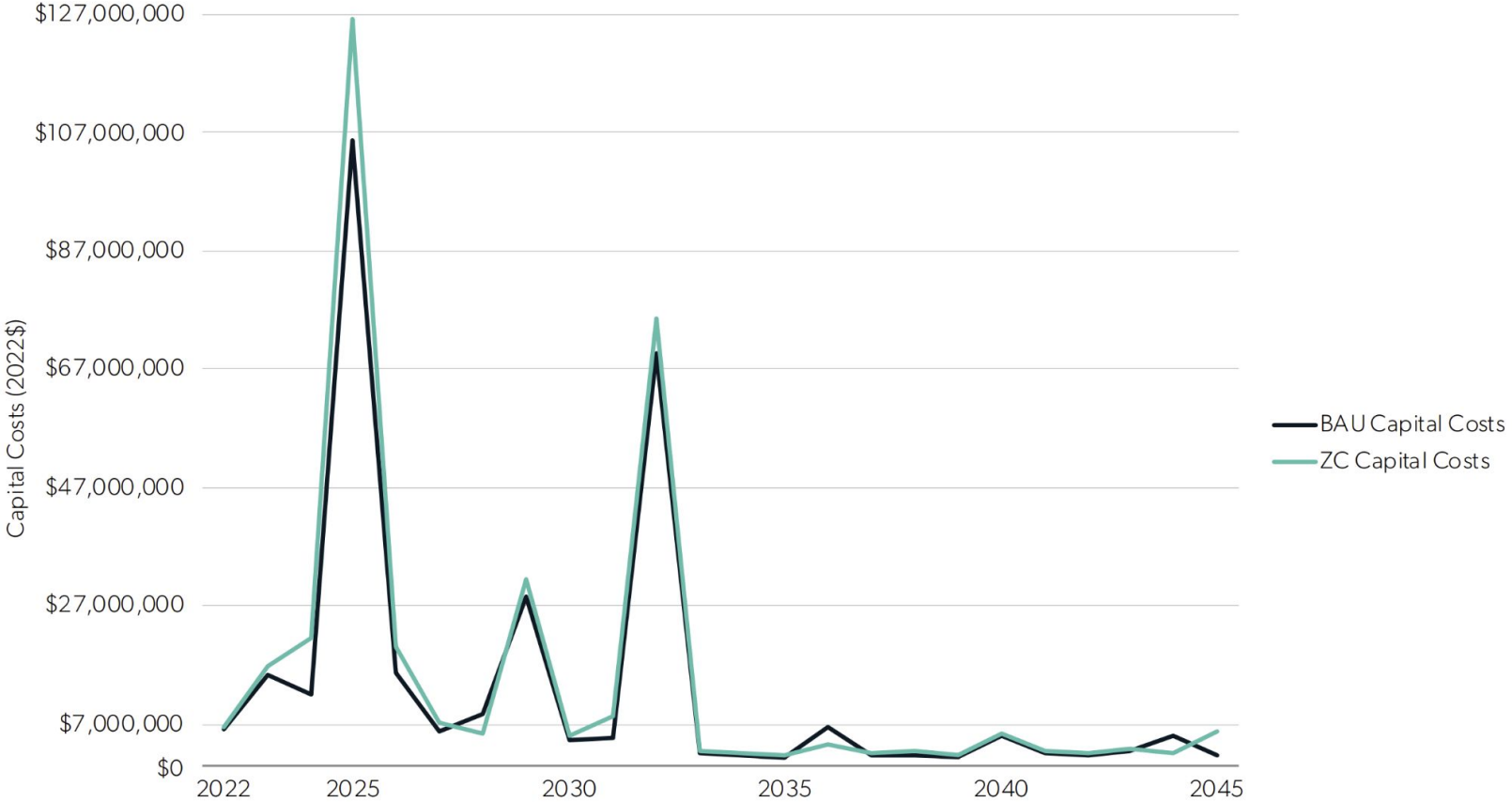
# Costs and Savings

# Incremental Cost Summary

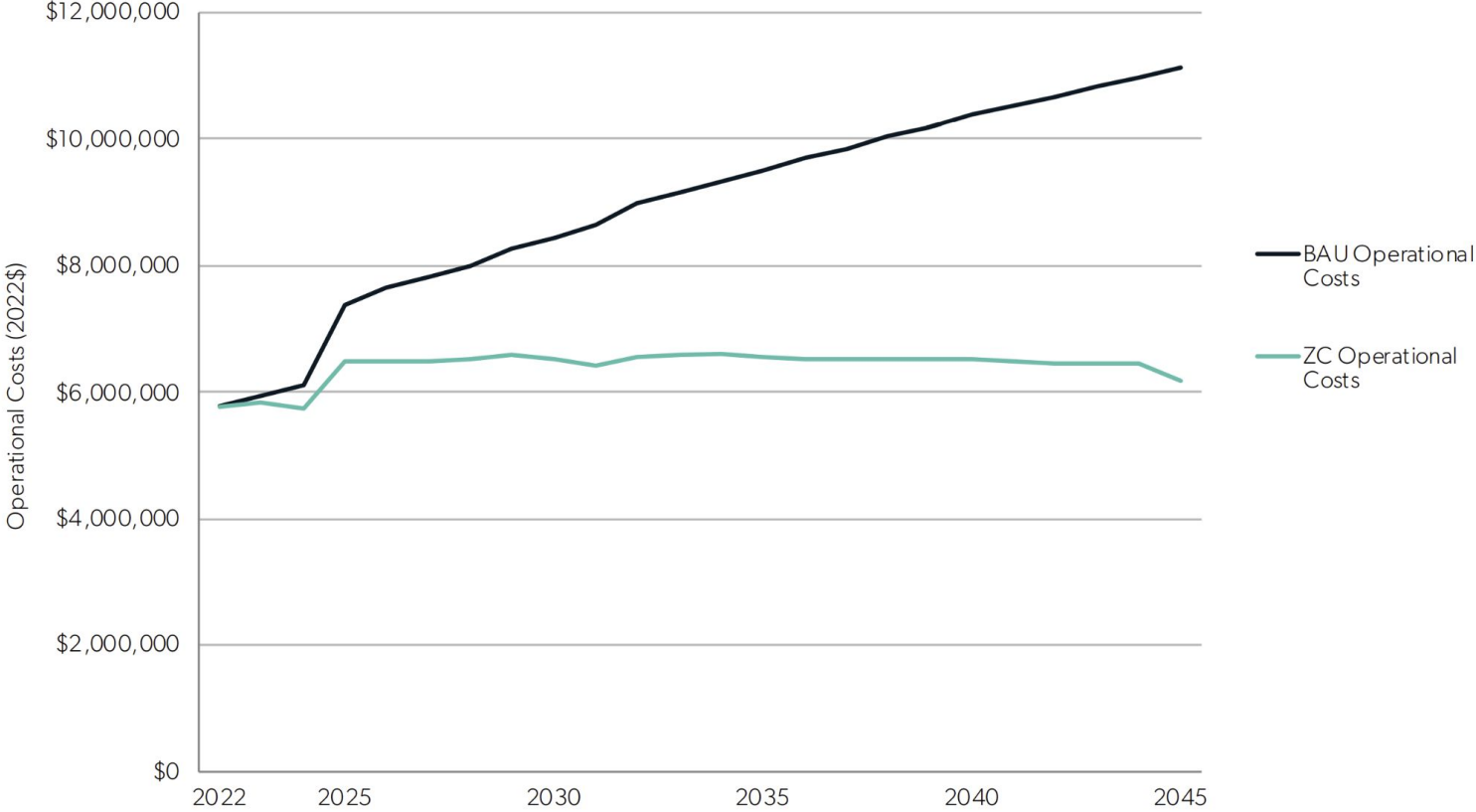
Incremental Capital Investment Required: \$63.7 M

Savings and Avoided Costs: \$75.3 M (+30.3 M)

# Capital Costs



# Operational (Avoided) Costs





2021

# Zero Carbon Whitby

The Corporate Plan To Reduce  
Greenhouse Gas Emissions

**Returns \$1.66 for every  
\$1 invested.**



# Key Town Learnings

- Decarbonization means ending the use of natural gas, gasoline and diesel.
- Energy efficiency is key. In 2045:
  - 82% of all energy will be grid electricity but...
  - The Town will also use 191 TJ less electricity!
- The earlier the work, the greater the savings.

# Methodology

# Operational Constraints

- Align with asset management schedule;
- Minimize interruptions to building operations;
- Minimize additional staff;
- Address long-term contract for natural gas;
- Use existing expertise and accommodate concerns.

## Approach focussed on operational ease

1. Identify the best time for major changes;
2. Identify maintenance costs rendered redundant.
3. **Identify for each change whether they would recommend, not recommend or have concerns about each change, and explain their concerns.**

Building Name	Status	Opportunity	Year	Assumed Project Costs (\$)	Facilities Notes
SPORTS CENTRE		Lower Pool Water Temperature	2023		
SPORTS CENTRE		Install Ultra-Low Flow Faucet Aerators	2022		
SPORTS CENTRE		Install Vending Machine Controls	2023		
SPORTS CENTRE		Implement a Cold Water Flooding System	2024		
SPORTS CENTRE		Upgrade to LED Fixtures	2025		
SPORTS CENTRE		Upgrade to LED Retrofit Lamps	2025		
SPORTS CENTRE		Install Occupancy Sensors	2025		
SPORTS CENTRE		Implement a Grey Water Flooding System	2026		
SPORTS CENTRE		Convert to Electric Ice Resurfacers	2026		
SPORTS CENTRE		Replace and Improve Roof Sections	2022		
SPORTS CENTRE		Solar PV - design/structural analysis			
SPORTS CENTRE		Solar PV - materials/installation			
SPORTS CENTRE		Install High Efficiency Furnaces	2026		
SPORTS CENTRE		GSHP - design/feasibility			
SPORTS CENTRE		GSHP - install loop			

Building Name	Status	Opportunity	Year	Assumed Project Costs (\$)	Facilities Notes
IROQUOIS PARK SPORTS CENTRE	Not required/ not recomm	Lower Pool Water Temperature	2023		Concerns about public comfort. This is also not required as pool will be heated with energy extracted by cold water flooding system.
IROQUOIS PARK SPORTS CENTRE	Completed or in progress	Install Ultra-Low Flow Faucet Aerators	2022		
IROQUOIS PARK SPORTS CENTRE	Recommended	Install Vending Machine Controls	2023		
IROQUOIS PARK SPORTS CENTRE	Some concerns	Implement a Cold Water Flooding System	2024		This is happening and heat drawn will eliminate the need for all boilers.
IROQUOIS PARK SPORTS CENTRE	Completed or in progress	Upgrade to LED Fixtures	2025		
IROQUOIS PARK SPORTS CENTRE	Completed or in progress	Upgrade to LED Retrofit Lamps	2025		
IROQUOIS PARK SPORTS CENTRE	Recommended	Install Occupancy Sensors	2025		
IROQUOIS PARK SPORTS CENTRE	Some concerns	Implement a Grey Water Flooding System	2026		Level of Service concerns regarding Ice Quality
IROQUOIS PARK SPORTS CENTRE	Some concerns	Convert to Electric Ice Resurfacers	2026		Level of Service (LOS) concerns regarding the ability to support facility flood schedule
IROQUOIS PARK SPORTS CENTRE	Recommended	Replace and Improve Roof Sections	2022		Need to review Audit recommendation and ability to install in Built Environment
IROQUOIS PARK SPORTS CENTRE	Some concerns	Solar PV - design/structural analysis	2026		Location, Cost and Structural loading requirements
IROQUOIS PARK SPORTS CENTRE	Recommended	Solar PV - materials/installation	2026		
IROQUOIS PARK SPORTS CENTRE	Not required/ not recomm	Install High Efficiency Furnaces		\$ (41,552.00)	
IROQUOIS PARK SPORTS CENTRE	Some concerns	GSHP - design/feasibility	2023		Timeframe is a concern based on resources and ability to complete this in one year
IROQUOIS PARK SPORTS CENTRE	Some concerns	GSHP - install loop	2024		Concerns regarding the timeframe to implement this, the complexity of the installation, the LOS interruptions to field and building operations

# Addressing Concerns

<b>Concern</b>	<b>Response</b>
Accuracy and detail of cost estimates	Added costs and time to complete structural analysis and detailed designs for decarbonization changes.
Speed and complexity	Gathered and incorporated costs for additional staff, new skills and training required.
Questioning whether it was 'realistic'	Council requested that this analysis be completed and that it inform the budget. So we needed to proceed with the best information we had.
Supply chain risks	A risk analysis was completed with proposed mitigations for all identified risks.

# Keys to the Project's Success



- Council's direction.
- Facilities staff capable of high-level net zero retrofit design.
- Completed energy audits for key buildings.
- Facilities staff actively engaged in scheduling and discussing the building retrofits.
- Fleet staff providing input to fleet decarbonization.
- Finance drafting Revolving Fund Policy.



# Preparatory Work for Buildings

# Sources of Information

- Climate Action Plan
- Carbon Budget
- Capital Budget
- Asset Management Plan
- Fleet Strategic Master Plan
- Lighting - Industry Best Practices
- Building Energy Audits
- New Building Designs
- Canadian Green Building Council Standards



# Buildings Step 1: Inventory and Grouping

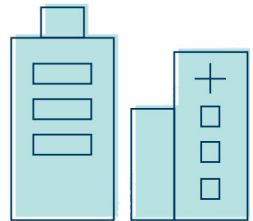
- **Profile:** Age, size, use
- **History:** Fuel types, energy consumption
- **Future:** Planned changes, demolitions
- **Group:** “Large”, “New/Changing”, “Std Archetype”

ID	Building Name	Primary Use Type/ Archetype	Gross Floor Area (sqft)	Year Built	Current Energy Sources	Unique, New/ Expanding or Standard Archetype?
1	ABC Community Centre	Community Centre	17,000	1978	Electricity only	Unique
2	North Recreation Centre	Recreation Centre	50,000	1991	Electricity, natural gas, water and sewer	Unique
3	Fire Hall 1	Fire Hall	8,393	2007	Electricity, natural gas, water and sewer	Archetype
4	Marina	Club House	6,050	2004	Electricity, natural gas, water and sewer	Archetype
5	Park Washrooms	Washroom	300	1992	Water and sewer	Archetype
6	Hockey Arena	Hockey Arena	100,640	2004	Electricity, natural gas, water and	Unique
7	Boat Storage building	Commercial Space	35,155	1974	Electricity only	Archetype
8	Smithside Daycare	Daycare Centre	5,410	1968	Electricity, natural gas, water and sewer	Archetype
9	Chambre of Commerce	Office Space	8,500	1948	Electricity, natural gas, water and sewer	Archetype

# Buildings Step 2: Business as Usual

Assemble 'business as usual' schedule and costs for each building:

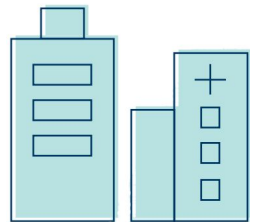
- Dates: completion, maintenance, renovations, change of use, end of use.
- Expected work and costs at each date.
- Forecast energy rates by fuel type.



# Buildings Step 3: Plan decarbonization for “Large buildings”

Describe pathway to net zero for each building.

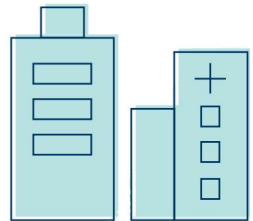
- Identify changes required by building.
- Itemize capital costs for net zero changes alongside BAP costs.
- Schedule changeover period to net zero.
- Document energy rates for current fuels until changeover and alternative fuels after.



# Buildings Step 4: Plan decarbonization for 'Archetype' Buildings

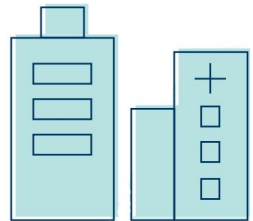
Incorporate standard archetype buildings.

- Identify appropriate archetype for each building.
- Establish low carbon pathway for each archetype using Canadian Green Building Standards.
- Apply LC archetype pathway and costs to each building.
- Schedule.



# Buildings Step 5: Plan decarbonization for New Buildings, and Expansions

- Incorporate requirements to make new construction (new builds and expansions) net zero as of construction date.
- Add estimated energy use and costs.
- Schedule, including scheduling the disposal of existing buildings, and their energy use and costs.

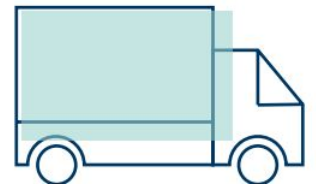


# Preparatory Work for Fleet



# Fleet Steps 1 and 2: Inventory and 'Business as Usual

- Create an inventory of vehicles and equipment
- Vehicle Type, Annual Mileage, Fuel Type, Expected Year of Replacement



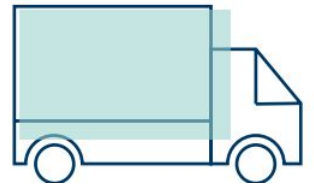
## Fleet Step 3: Identify Redundant Costs

- Create a list of operational and capital costs that will no longer be required for decarbonized fleet, by vehicle type



## Fleet Step 4: Evaluate potential for refurbishing vehicles

1. Replacing ICE system with electric drive train.
2. Regularly refurbishing vehicle bodies and interiors.



THANK YOU

SSG

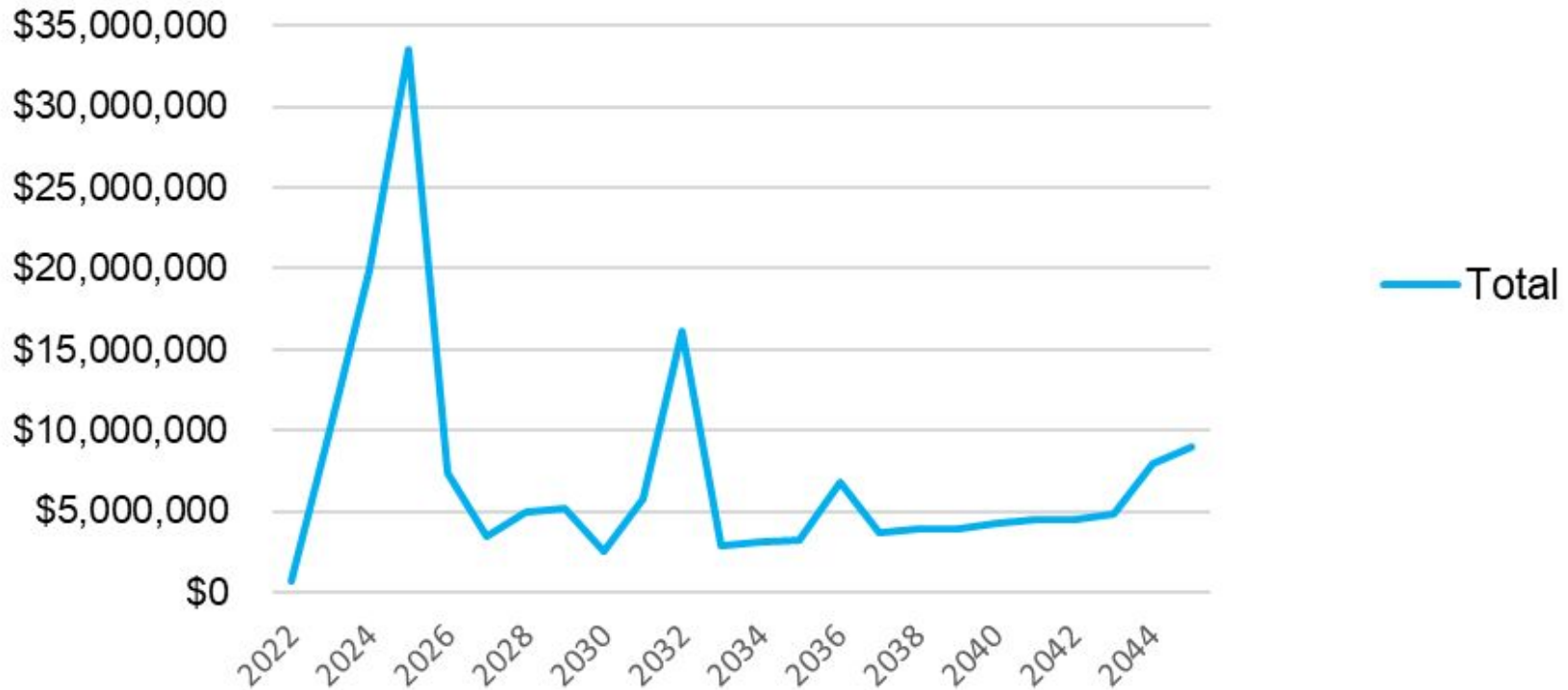
# Additional info on Revolving Reserve Fund

# Revolving Reserve Fund

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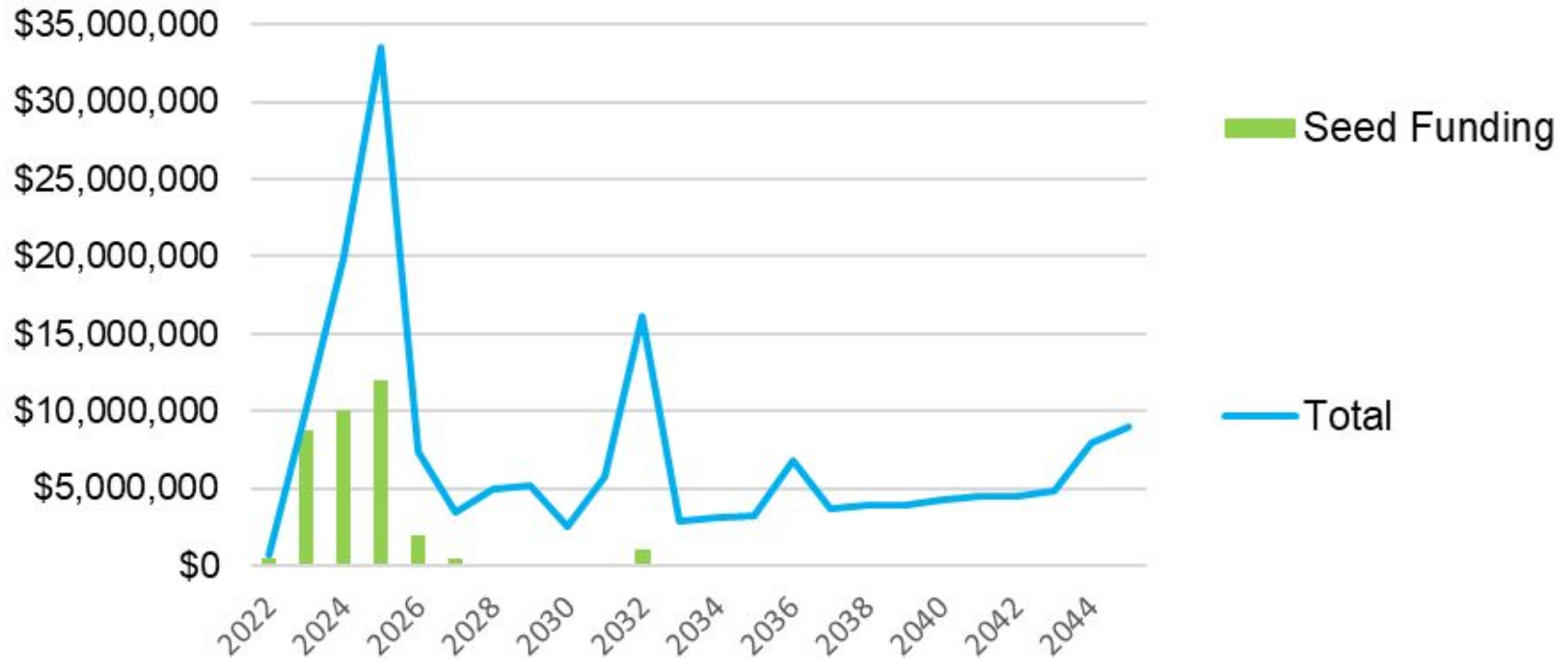
- Seed funding of \$34.8 million plus the energy, carbon tax and selected capital savings from plan can fund 100% of the incremental cost.
- \$31.3 million required by the end of 2025.
  
- Staff have already applied for \$41,750,000 in funding.

# Revolving Reserve Fund over Time

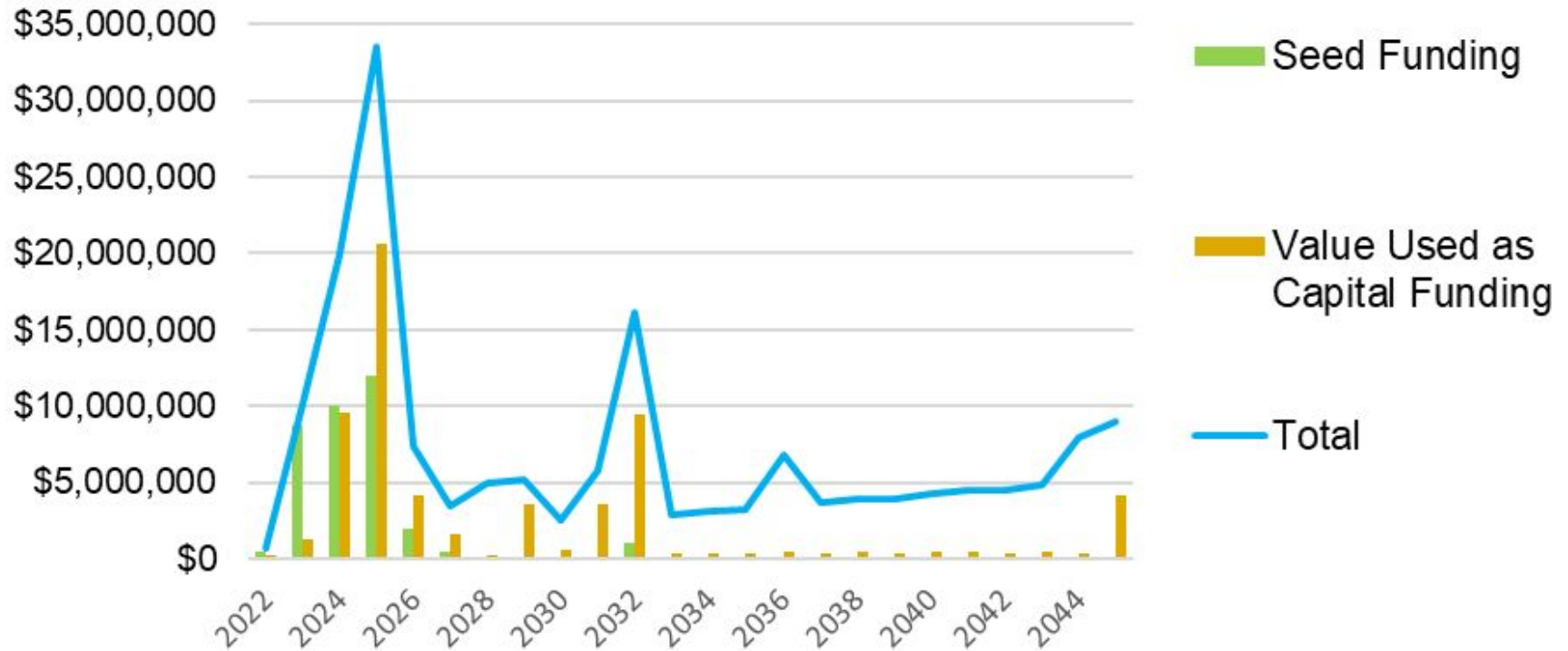




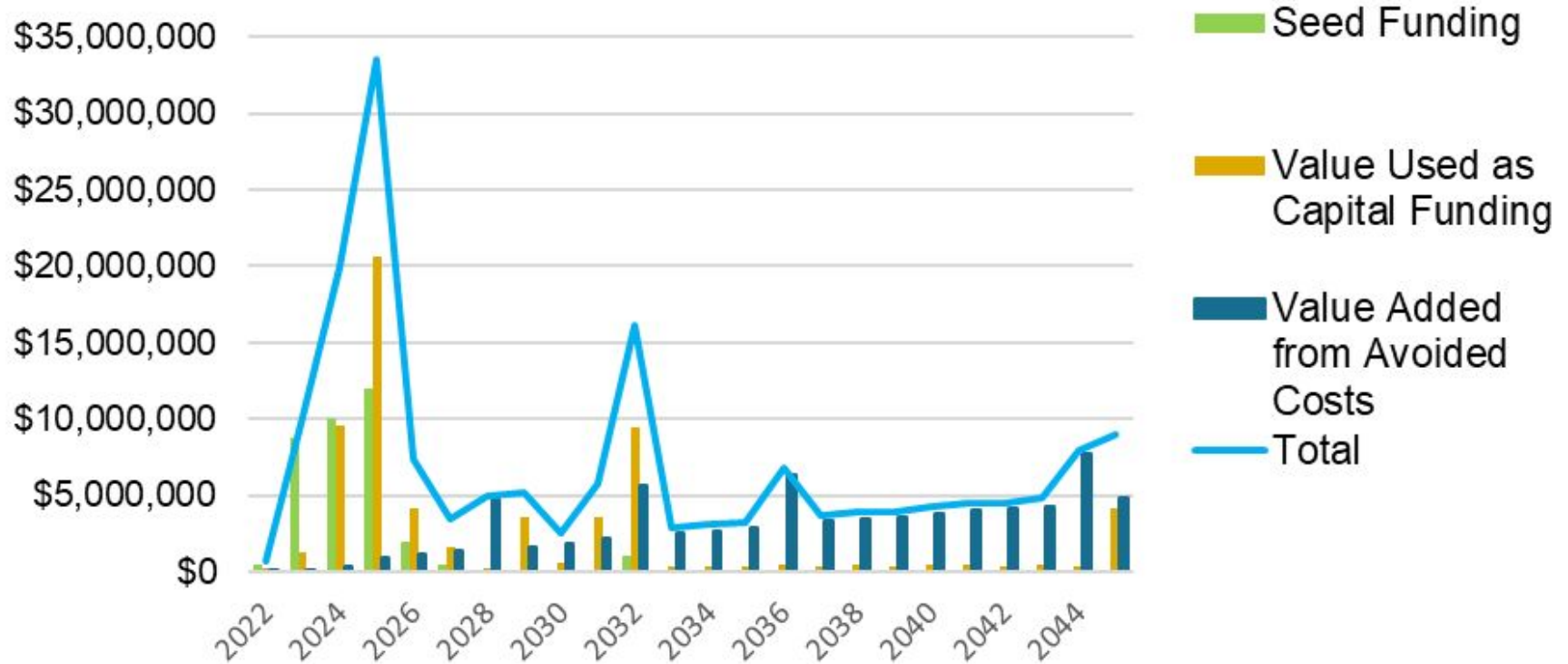
# Revolving Reserve Fund over Time



# Revolving Reserve Fund over Time



# Revolving Reserve Fund over Time



# Financing Alternatives

# Additional Funding

- Green Community Bonds (Town)
- Green Community Bonds (Region)
- Green Corporate Bonds
- Traditional Bank Loans
- Canadian Infrastructure Bank Loans
- Tax Levy

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