Niagara Transit

FLEET ELECTRIFICATION STRATEGY & IMPLEMENTATION STUDY

PROJECT SUMMARY

February 17, 2026

Agenda

1. Introduction & Transition Roadmap Summary
2. GHG Emission Reductions
3. Conclusions and Recommendations
4. Additional Information

INTRODUCTION & ROADMAP SUMMARY

Introduction

- Niagara Transit's Fleet Electrification Strategy and Implementation FEED Study defines the technical requirements and budgetary commitments necessary to support a phased transition to a zero-emissions fleet, including all associated capital and infrastructure improvements.
- The implementation strategy builds on previous studies by the St. Catharines Transit Commission and Niagara Falls Transit that evaluated both battery-electric and hydrogen-fuel bus technologies
- The key objectives of the fleet electrification strategy and implementation plan include:
  - demonstrating a reduction in greenhouse gas (GHG) emissions
  - ensuring operational continuity
  - providing value to all regional taxpayers and residents.

Transition Roadmap Summary

01 Transitioning Niagara Transit (NT) to a fully electrified revenue fleet is expected to cut lifecycle GHG emissions by as much as 98% relative to existing operations.

- NT's current GHG emissions are expected to drop from **16,300 to under 400 tonnes CO_2e per year** by Year 12: a significant environmental achievement.
- **This is equivalent to removing about 3,500 passenger vehicles from the road for one year, or the annual energy use of over 2,000 homes in Ontario.**

02 The implementation strategy prioritizes the **transition to battery electric buses at St. Catharines first** - this reflects the maturity of BEB technology and is widely adopted by transit agencies across Canada.

- **Hydrogen fuel technology** was assessed and found to require further market maturity and cost reductions before large-scale adoption.
- Niagara Falls' proximity to Atura is an advantage for potential future hydrogen deployment, once the technology and market conditions are more favourable.

Transition Roadmap St. Catharines

03

- **14-year transition plan**: 2 years for planning and procurement, followed by 12 years of phased Battery Electric Bus (BEB) implementation.
- **Two-phase construction approach**:
  - Phase 1 (starting Year 1) supports BEB deployment in Years 2–6.
  - Phase 2 completed by Year 5, enabling continued rollout through Year 12.
  - Charger installation phased over Years 1–7 to match vehicle delivery and garage readiness.
- **Operational approach**: Depot-only charging model, with spare vehicles added in Year 9 to support the growing electric fleet.

Transition Roadmap Niagara Falls

04

- **Single-phase retrofit**: Niagara Falls garage upgrades completed in one construction phase, with electric operations beginning in Year 6.
- **Strategic timing:** The delayed transition allows time for hydrogen fuel cell technology to mature and costs to decline, preserving flexibility beyond battery-electric buses.
- **Charging requirements:** Niagara Falls will require both depot and on-route charging, including five on-route chargers at the Welland Bus Terminal phased in over five years.

Transition Roadmap

05

- Both garages will receive a Utility-led service upgrade, together with the implementation of distribution system improvements, a battery energy storage system, and standby generators led by NT.

06

- The transition plan increases the 40–ft bus fleet from 122 to 129 units (+6%) and the 60-ft fleet from 22 to 35 units (+59%), while paratransit vehicles remain unchanged given their lighter operational demands.

Transition Roadmap

07

Implementing the transition roadmap is expected to cost **53% more** than business-as-usual at the St. Catharines facility and **84% more** at Niagara Falls, equating to a **66% increase agency-wide**.

Over the 12 years:

St Catharines

- Operating costs decrease from **$59.2m** to **$34.4m** (-42%)
- Capital costs increase from **$92.4m** to **$197m** (+113%)

Niagara Falls

- Operating costs decrease from **$40.8m** to **$34.27m** (-16%)
- Capital costs increase from **$74.4m** to **$178.5m** (+139%)

- Implementing a **charging management system** can reduce electricity cost expenditure by shaving the peak demand.

Capital Investments

The 12-year transition to a zero-emissions fleet will require an additional **$208.7M**

- $153.9M for fleet and charging equipment ($12.8M per year)
- $54.8M for garage upgrades.

Unit: $Million	BAU	BAU	Transition Plan	Transition Plan
12 Year transition	**St. Catharines**	**Niagara Falls**	**St. Catharines**	**Niagara Falls**
CAPEX Fleet	92.4	74.6	158.6	137.7
CAPEX Charging Equipment	--	--	12.2	12.3
Totals (M$)	**92.4**	**74.6**	**170.8**	**150.0**
Difference from BAU ($)	--	--	78.4	75.4
Difference form BAU (%)	--	--	**+85%**	**+101%**

One-time Infrastructure Upgrades (Garage Modifications)

- St Catharines: $26,252,700
  - Phase 1(Yr 1): $20,741,800
  - Phase 2 (Yr 5): $5,510,900

Niagara Falls (Yr 6): $28,524,400

Operating Costs

The transition to a zero-emissions fleet will save **$31.4M** ($2.6M / yr over 12 years)

- $27.6M for fuel / electricity.
- $3.8M for maintenance.

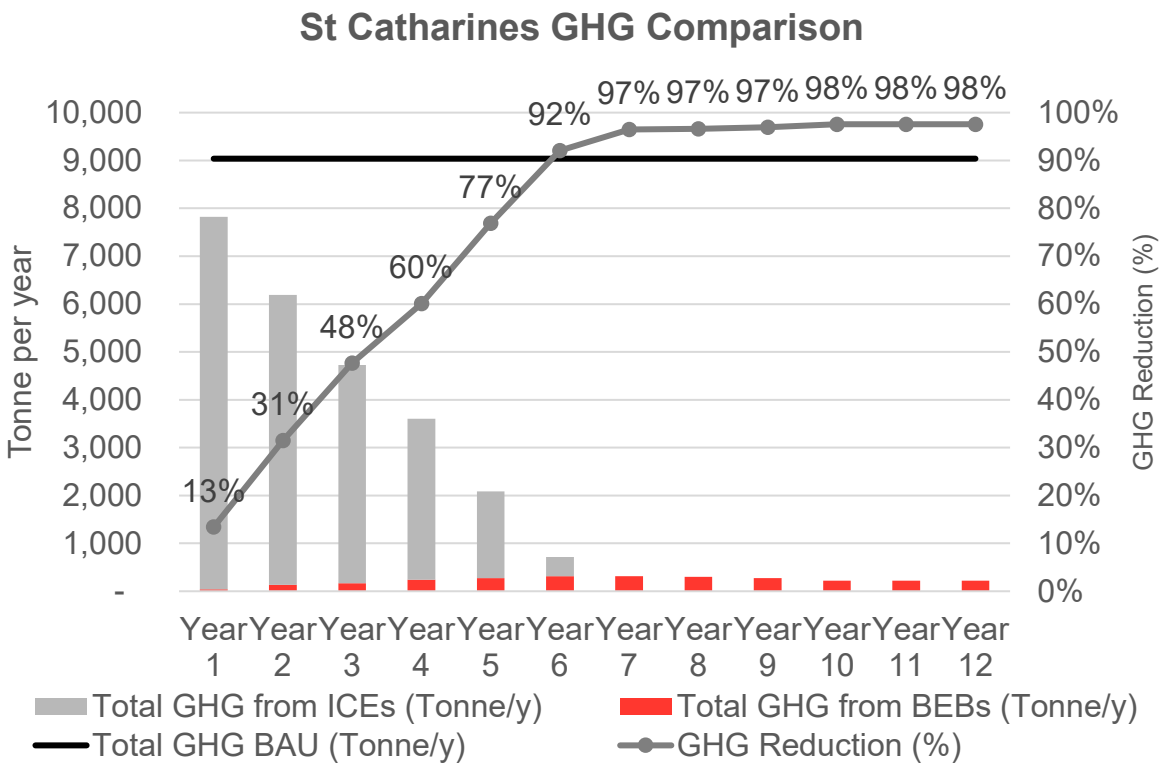
Unit: $Million	BAU	BAU	Transition Plan	Transition Plan
12 Year transition	**St. Catharines**	**Niagara Falls**	**St. Catharines**	**Niagara Falls**
OPEX Fuel / Electricity	33.3	26.7	12.1	20.3
OPEX Maintenance	25.9	14.1	22.3	14.0
Totals (M$)	**59.2**	**40.8**	**34.4**	**34.3**
Reduction from BAU ($)	--	--	24.8	6.5
Reduction form BAU (%)	--	--	**-41.9%**	**-15.9%**

The % reduction at Niagara Falls is lower due to the later transition of its fleet.

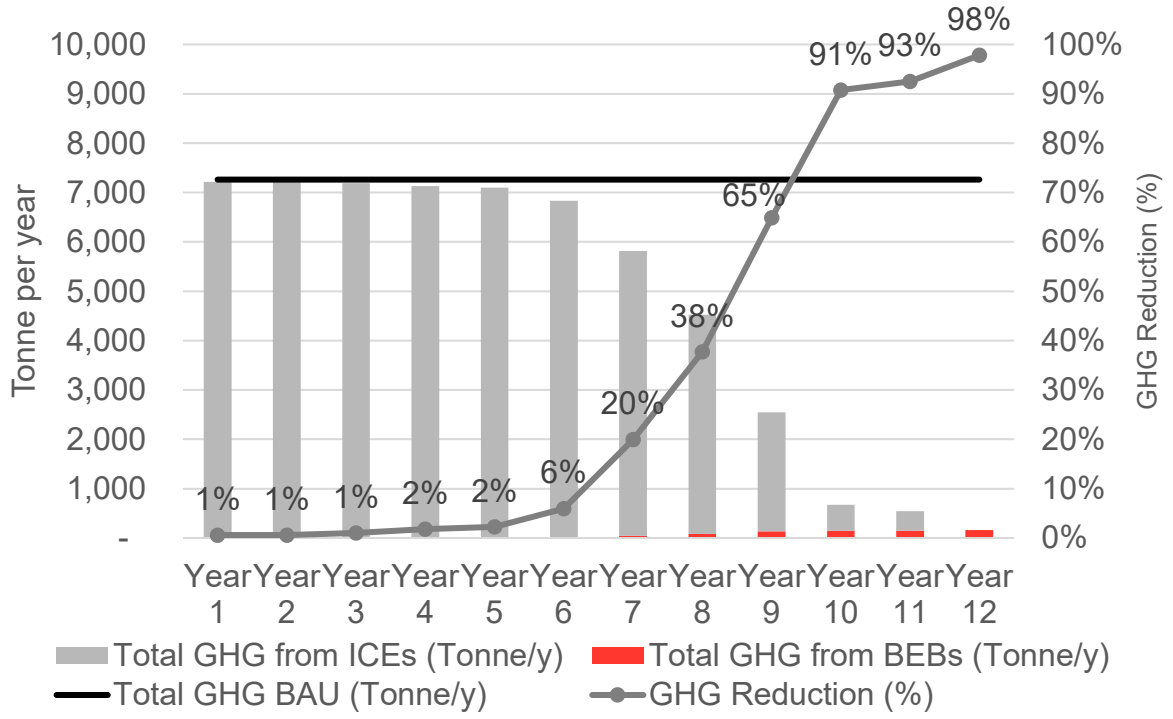
GHG EMISSIONS REDUCTION

Environmental Benefits of Fleet Electrification

- The study shows that NT can achieve **98%** reduction in GHG emissions over a 12-year period compared to a business-as-usual scenario. This is the equivalent of removing about 3,500 cars from our roads or the annual energy use of over 2,000 homes in Ontario each year.
- These reductions are substantial and sustained and will improve as the grid becomes cleaner.



- St Catharines emits more GHG than Niagara Falls in BAU, but prioritizing its transition decarbonizes more buses in a faster timeframe.



- By Year 10, both garages reduce their GHGs by over 90%.

Environmental Benefits of Fleet Electrification Continued

- Transitioning to a fleet of BEBs is a transformative opportunity for environmental leadership in Ontario. Ontario has one of the cleanest electricity grids in Canada and are positioned to maximize climate benefits of transportation electrification.
- The transition supports NT's climate goals, improves air quality, and reinforces the Region's commitment to a low-carbon future:
  - **Healthier Communities -** Electrification eliminates tailpipe emissions from buses, improving air quality in our neighborhoods and school zones.
  - **Modernized Workforce -** This transition will invest in our local workforce: upskilling will prepare mechanics, drivers, and other staff for the new operational models that electrification will present – like high-voltage safety training to new digital tools - ensuring our workforce is future-ready.

CONCLUSIONS & RECOMMENDATIONS

Conclusions and Recommendations

1. The transition roadmap will cost 53% more than business as usual at the St. Catharines facility, and 84% more than BAU for the Niagara Falls facility, and in aggregate, 66% more than BAU for both facilities.
2. A fully electrified revenue fleet is forecast to reduce lifecycle GHG emissions by up to 98% compared to BAU.
3. Overhead pantograph chargers at depot locations are the preferred technology for 40-ft and 60-ft BEBs, while plug-in chargers will be used for paratransit buses.
4. The overall revenue fleet size will increase from 122 to 129 (+6%) for 40-ft buses and from 22 to 35 (+59%) for 60-ft BEBs. Paratransit shuttles will remain unchanged due to their relatively lighter duty cycles.
5. Implementing a charging management system can reduce electricity cost expenditure by shaving the peak demand.
6. St Catharines garage retrofit work is proposed in two phases: Phase 1 covers the first five years of BEB deliveries, with a planned opening day from Year 1. Phase 2 covers years 6 to 12, with an opening day in Year 5.
7. Niagara Falls retrofits can be completed in a single construction phase, with a planned opening day in Year 6.
5. The construction and installation of chargers at both facilities should be coordinated with the procurement and delivery of BEBs.
6. Roof-mounted reinforcement supports are proposed to accommodate the additional weight of interior pantographs
7. Electrical infrastructure at both garages supports fleet charging through utility-led service upgrade, distribution system improvements, battery energy storage system, and standby generators led by NT.
8. Five on-route chargers are proposed to be implemented over five years at Welland Bus Terminal.

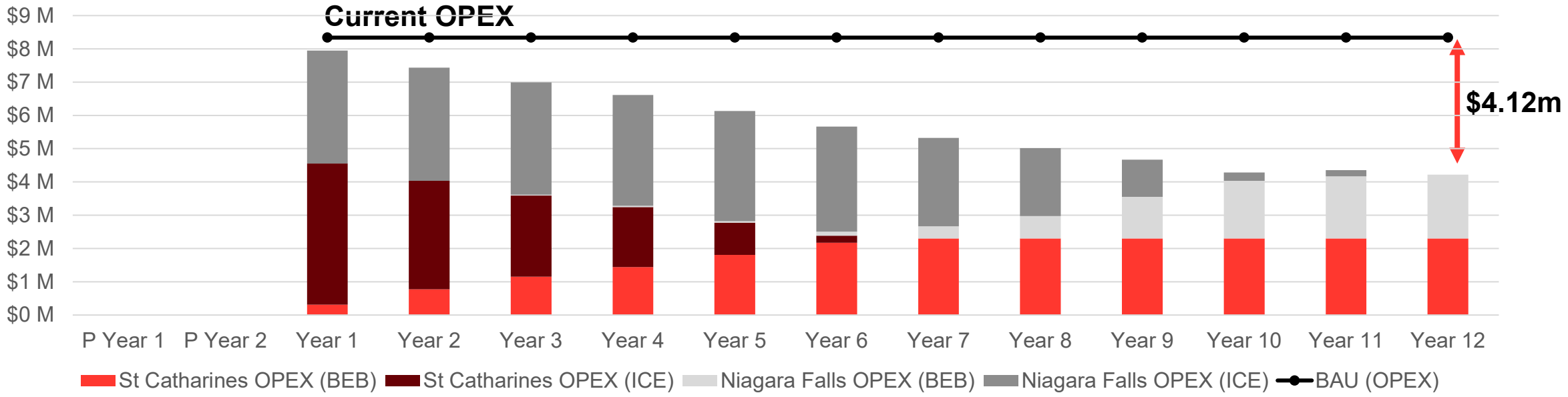
ADDITIONAL INFORMATION

COSTS

Operating Costs

Average Annual OPEX

- Transition Total: $5,721,092 / yr (over 12 years)
  - For St Catharines: $2,864,900 / yr (over 12 years)
  - For Niagara Falls: $2,856,192 / yr (over 12 years)
- BAU: $8,337,400 / yr (over 12 years)
- Average OPEX savings: $2,616,308 / yr (over 12 years)
- **12-Year OPEX savings: $31,395,700**
- **100% BEB OPEX savings: $4,115,100 / yr (after transition)**

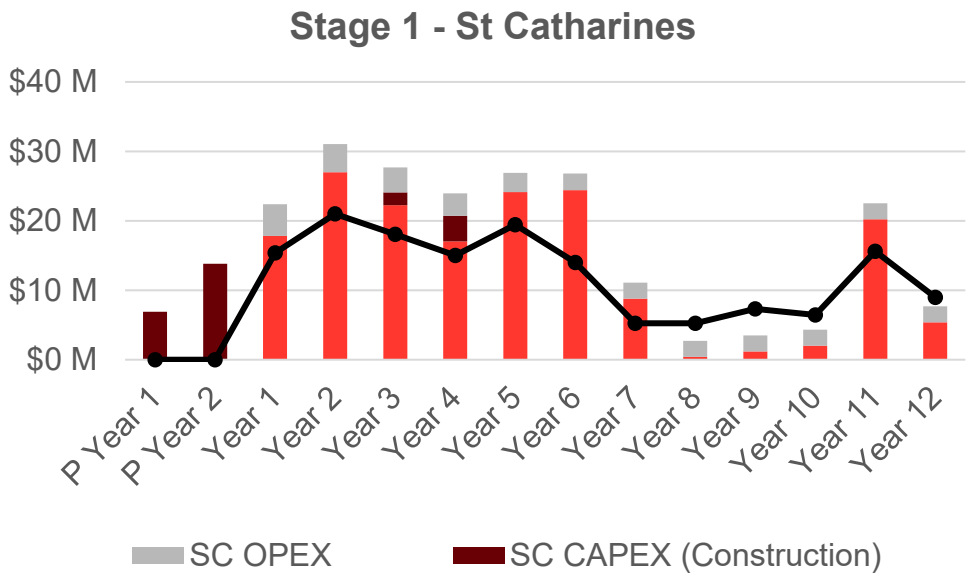


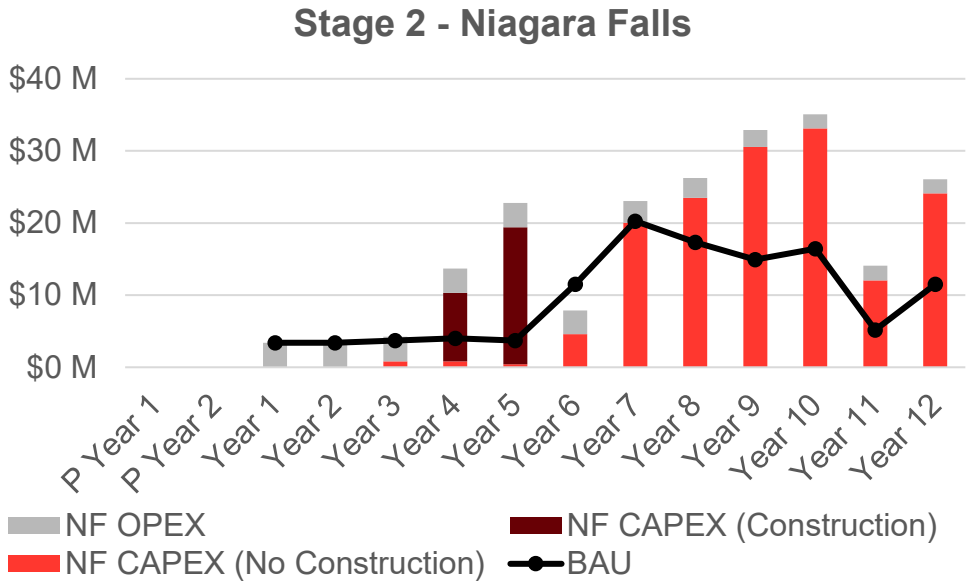
Total CAPEX and OPEX

- Total costs include the costs **of facility construction**, **BEBs**, **chargers / cabinets** and **dispensers**, as well as the **costs of operating and maintaining both diesel and electric fleets**.
- Transition will cost **53% more than business as usual** at St. Catharines, and **84% more than BAU at Niagara Falls** facility, and in aggregate, **66% more than BAU for both facilities**.

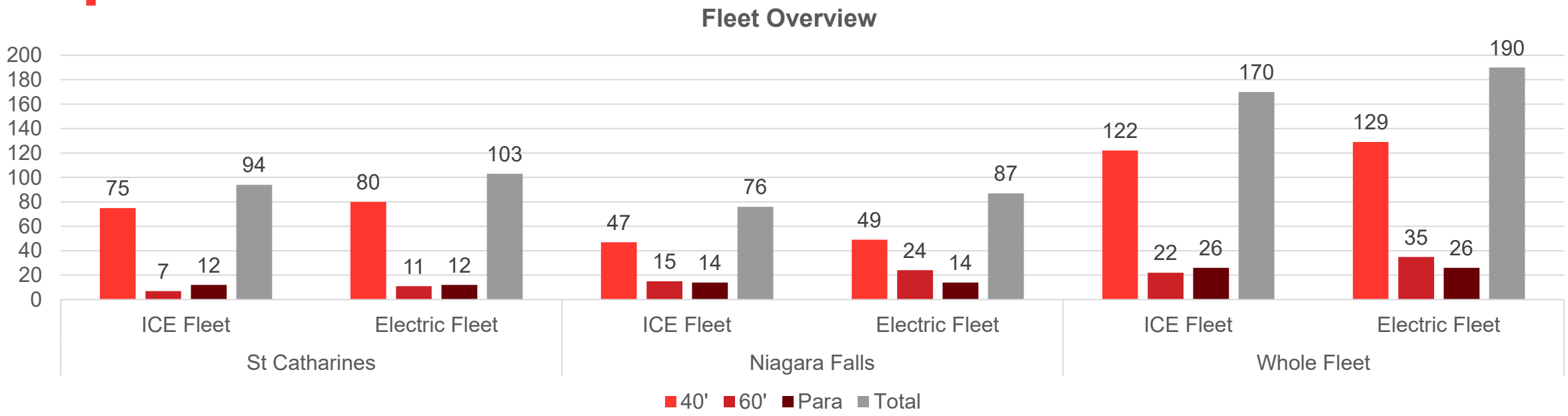
Total Costs

• Transition Total:	$444,147,000	($31,725,000 / yr)
• For St Catharines:	$231,373,000	($16,527,000 / yr)
• For Niagara Falls:	$212,774,000	($15,198,000 / yr)
• BAU Total:	$267,010,000	($22,251,000 / yr)
• For St Catharines:	$151,636,000	($12,636,000 / yr)
• For Niagara Falls:	$115,374,100	($9,614,500 / yr)





Fleet Details



	St Catharines	St Catharines	Niagara Falls	Niagara Falls	Whole Fleet	Whole Fleet
	ICE Fleet	Electric Fleet	ICE Fleet	Electric Fleet	ICE Fleet	Electric Fleet
40-ft	75	80	47	49	122	129
60-ft	7	11	15	24	22	35
Paratransit Vehicles	12	12	14	14	26	26
Total	94	103	76	87	170	190

Paratransit shuttles have a shorter useful life than standard buses, i.e., 8 years instead of 12 years.

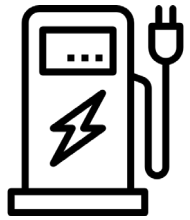
	Past Useful Life
40-ft	26%
60-ft	0%
Paratransit Vehicles	12%

26% of our 40-ft buses are beyond their expected useful life.

Unit Cost Details

Vehicles	Unit Cost
40–ft BEB	$1,560,000
60–ft BEB	$2,269,091
Electric Paratransit Vehicles	$400,983
40–ft diesel bus	$1,005,840
60–ft diesel bus	$1,479,500
Diesel Paratransit Vehicles	$300,000

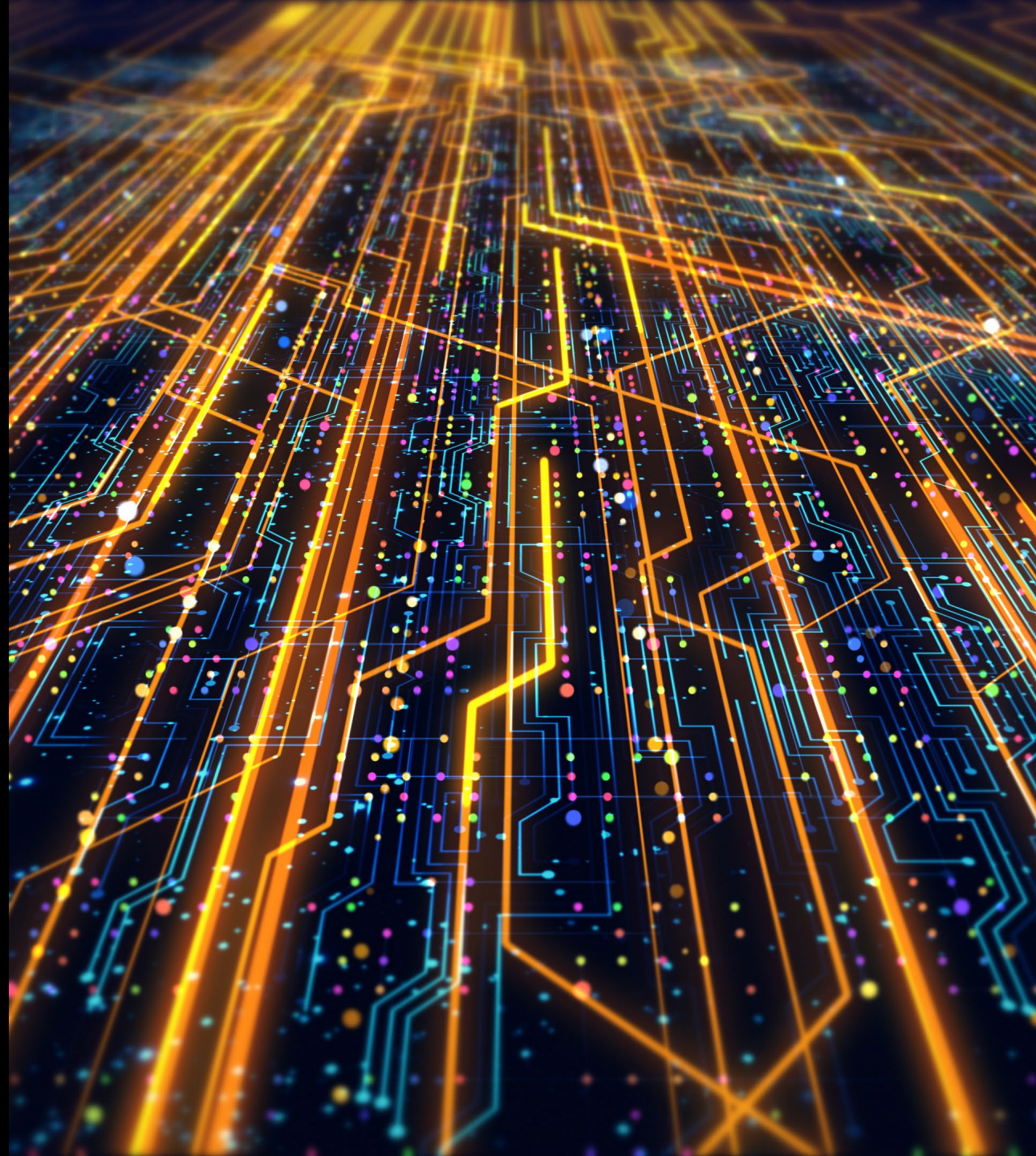
Chargers (labour excluded)	Unit Cost
150kW depot charger cabinet	$130,000
200kW depot charger	$180,000
Depot charger pantograph (150kw)	$80,000
Depot charger plug-in dispenser (200kw)	$60,000
450kW on-route charger cabinet	$330,000
450kW on-route charger pantograph	$100,000



Depot Chargers
- 200kW: 4 dispensers for each cabinet
- 150kW: 2 dispensers for each cabinet.

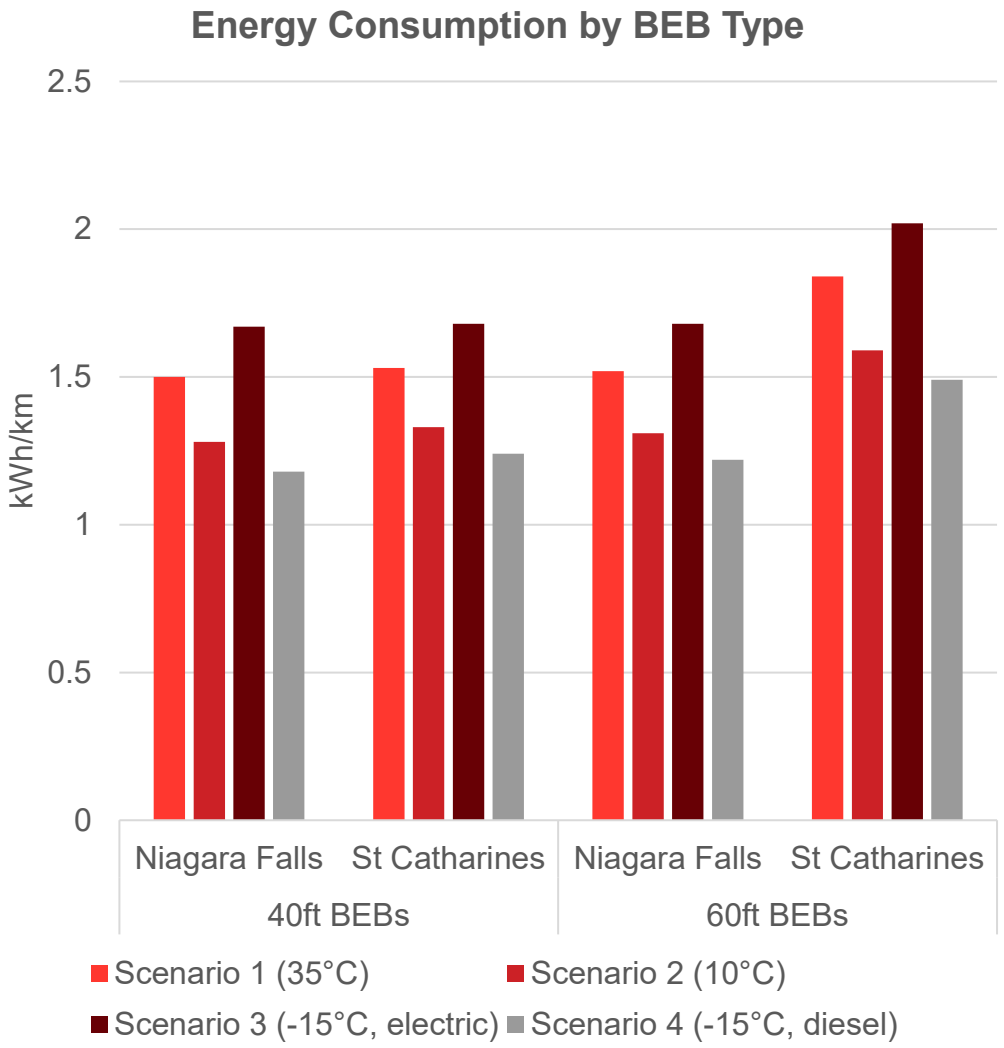
On-Route Chargers
- 1 cabinet for each pantograph

FEASIBILITY ASSESSMENTS & CHARGING STRATEGY



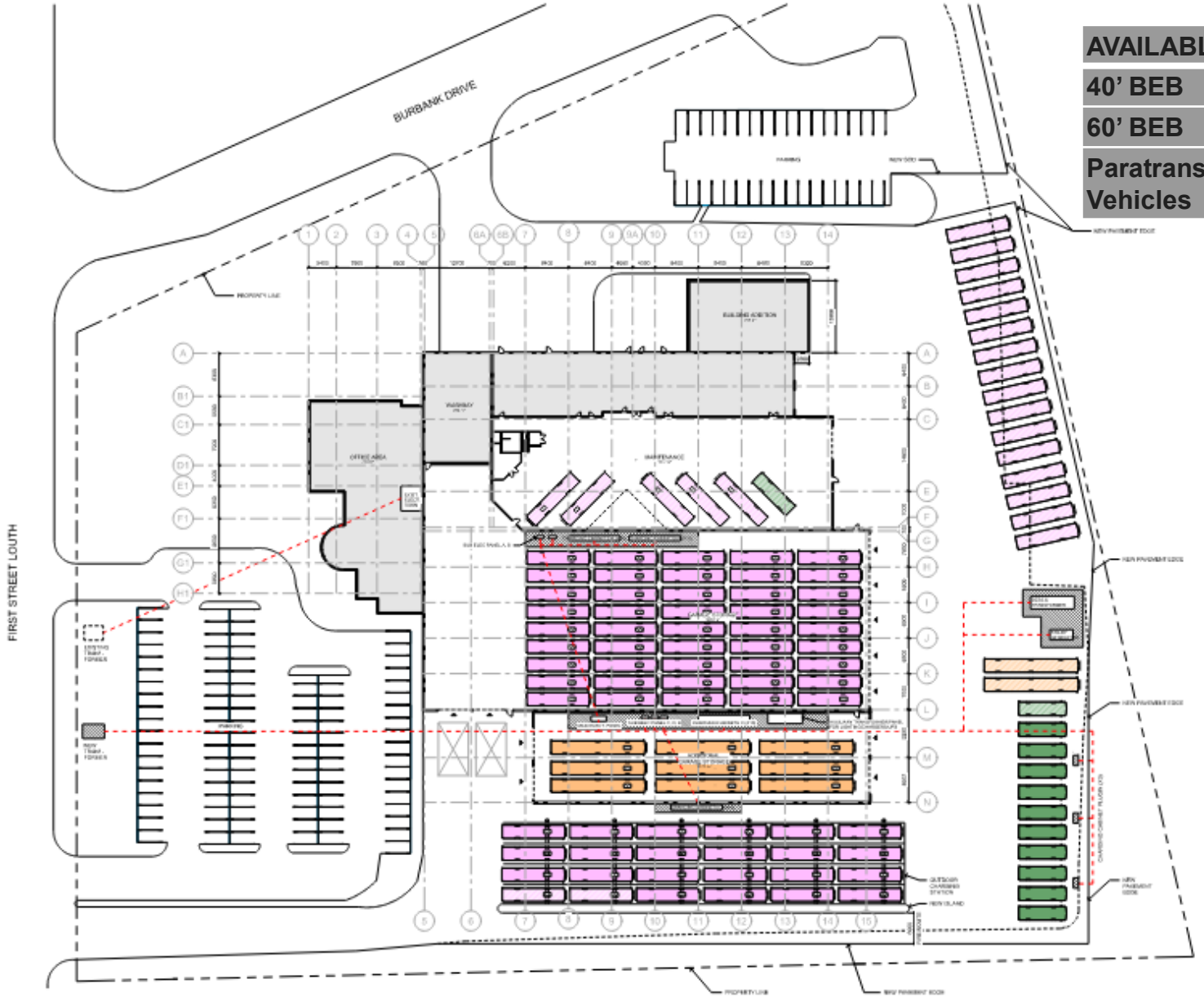
Charging Strategy

- Four scenarios were evaluated to guide BEB fleet electrification, to test electrification feasibility and performance under a range of temperatures and operating conditions.
- **Depot-only charging is recommended for St. Catharines**, maximizing the utility of electrical infrastructure investments at the garage.
- **For Niagara Falls, a combination of depot charging and on-route charging is preferred** to address longer routes and heavier duty cycles there.
- Splitting and restructuring of transit service blocks is needed to support the charging strategies – this introduces ***dynamic block assignment*** and **mid-day charging**, impacting existing operational complexity.
- A **charge management system is proposed to flatten peak demand** compared to uncontrolled and on-route charging.



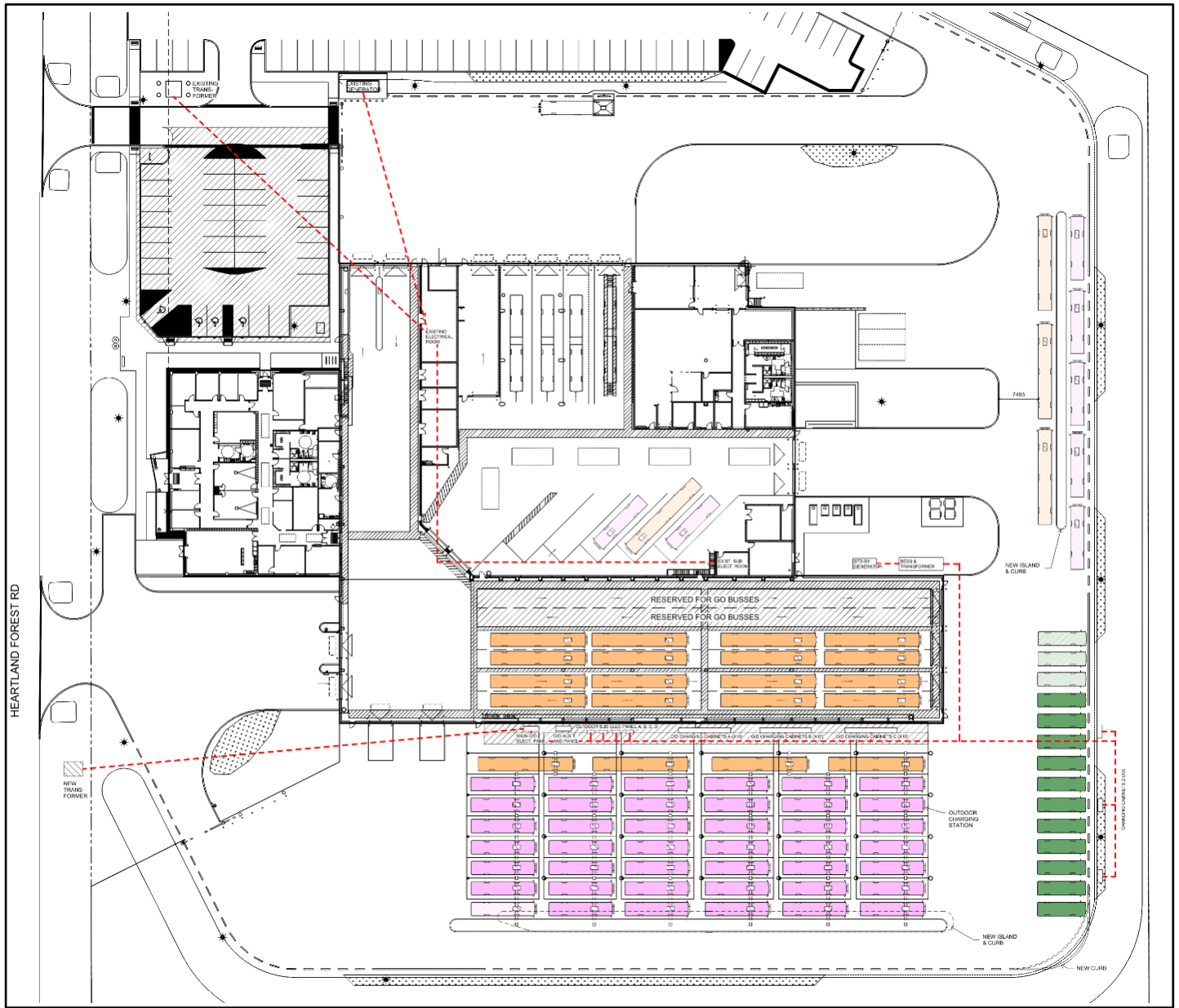
DEPOT LAYOUTS

Proposed Site Plan – St Catharines



AVAILABLE SPACE	Core Fleet	Spares	Total
40’ BEB	67	23	90
60’ BEB	9	2	11
Paratransit Vehicles	10	2	12

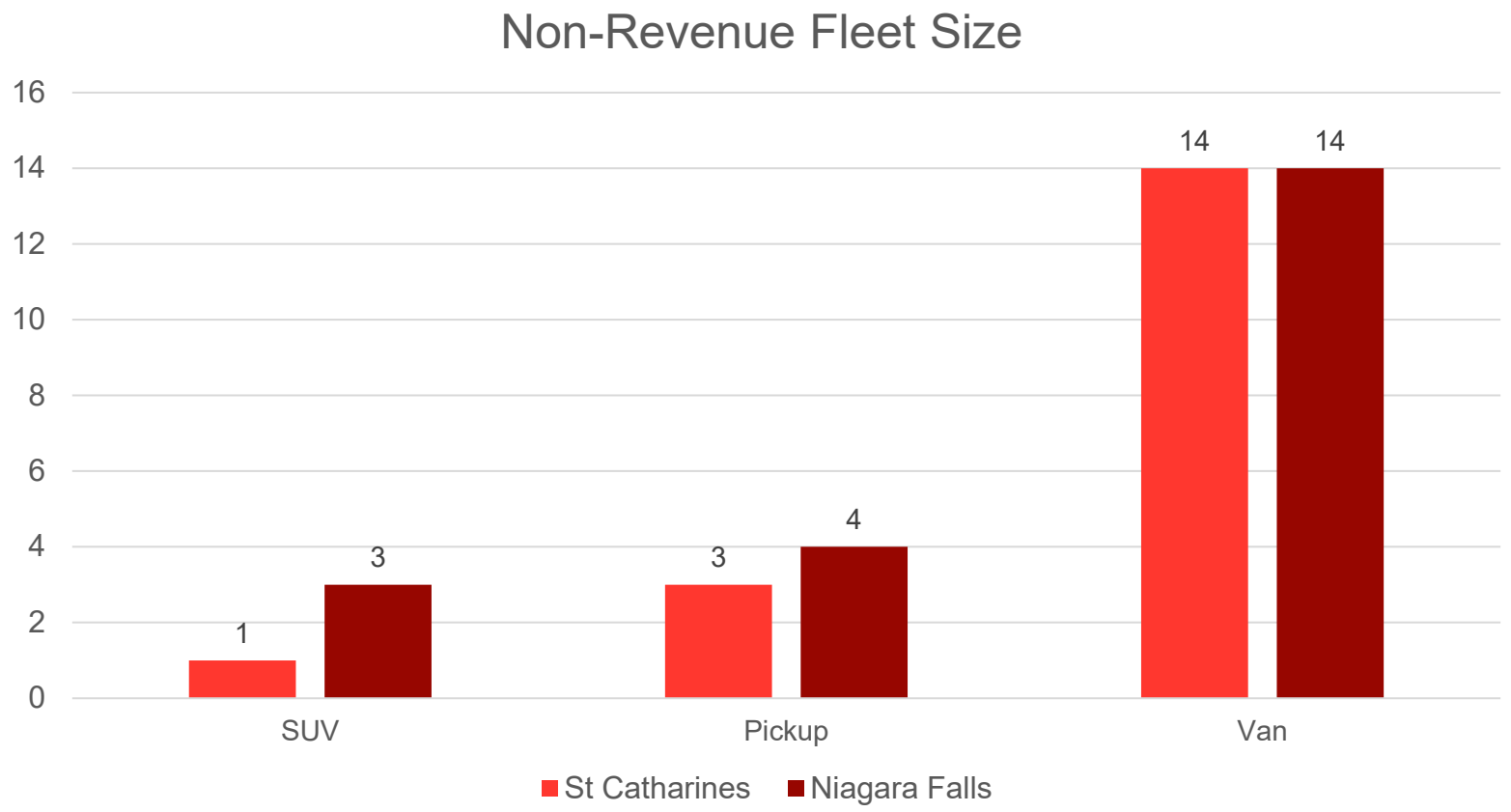
Proposed Site Plan – Niagara Falls



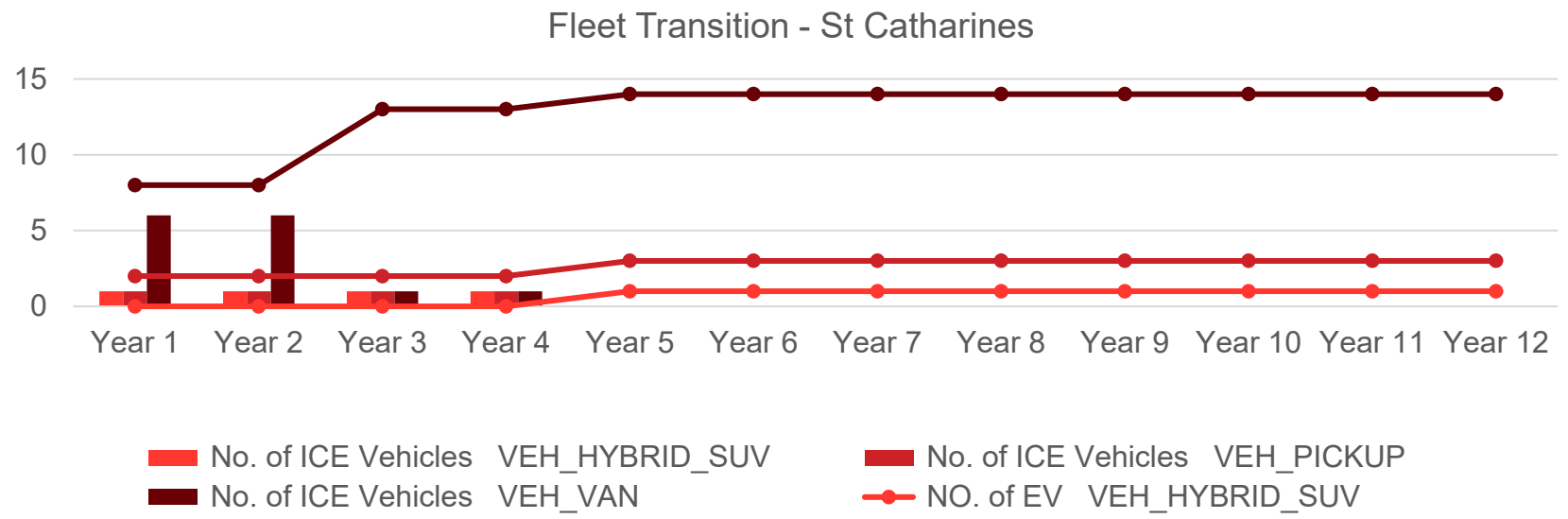
AVAILABLE SPACE	Core Fleet	Spares	Total
40' BEB	**71**	**8**	**79**
60' BEB	20	4	24
Paratransit Vehicles	11	3	14

NON-REVENUE FLEET

Non-Revenue Fleet



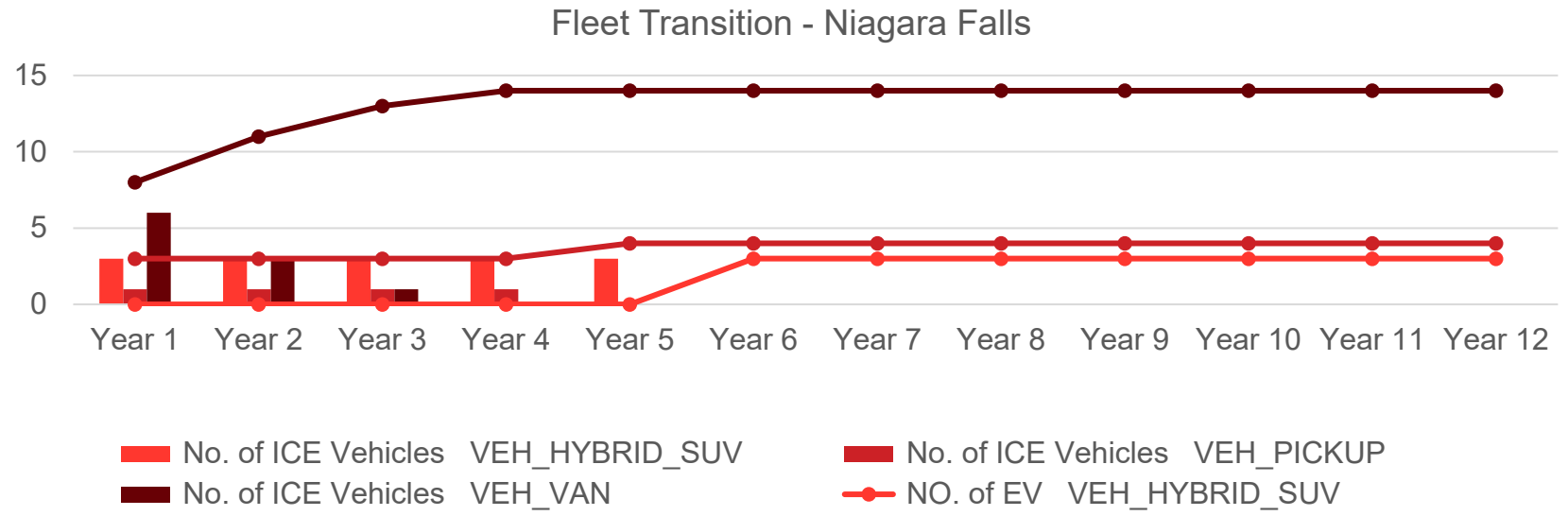
Fleet Transition Plan



The fleet transition plan assumes the expected useful life to be eight years for all non-revenue vehicles.

At St Catharines depot, the non-revenue vehicles can be fully electrified by the fifth year under the current transition plan.

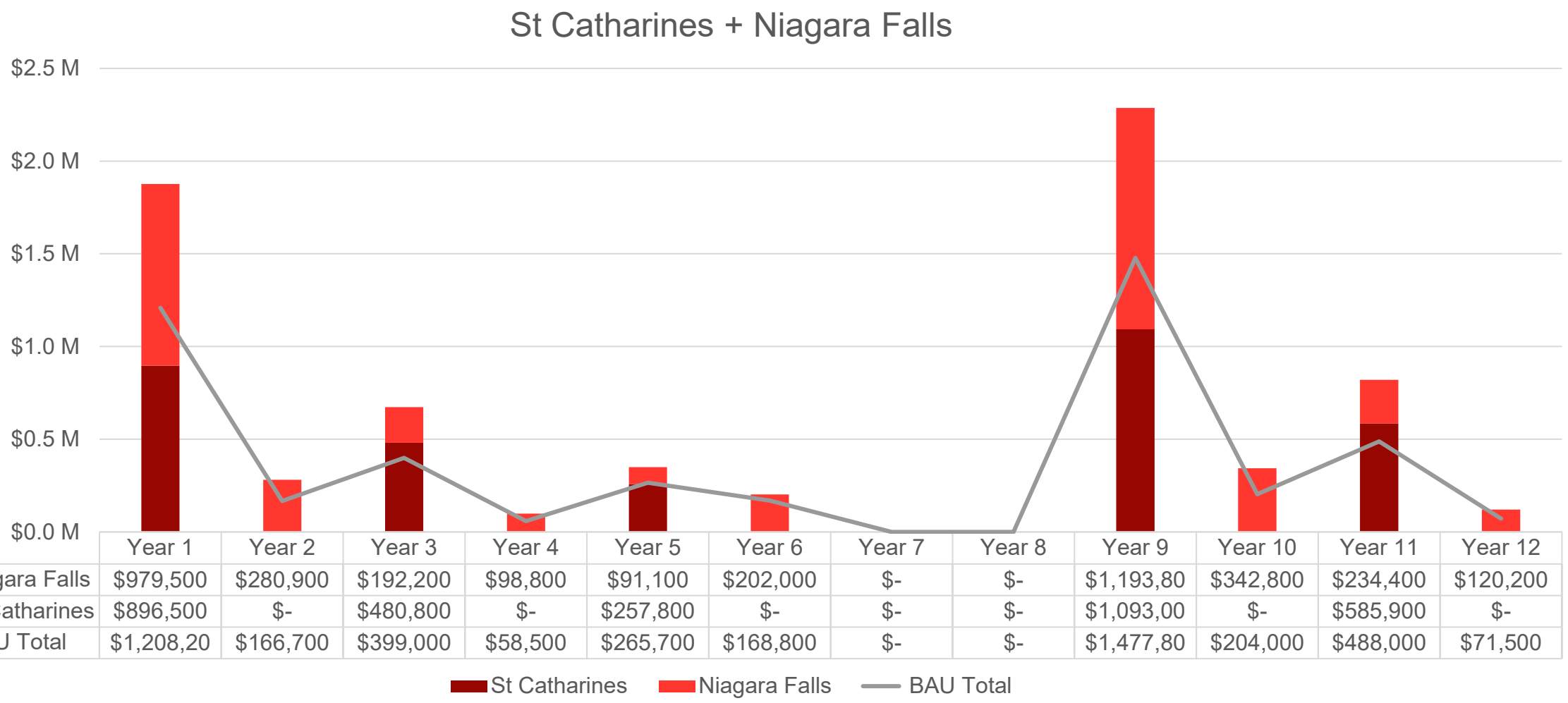
All types of vehicles are fully electrified at the same time.



At Niagara Falls depot, the non-revenue vehicles can be fully electrified by the sixth year under the current transition plan

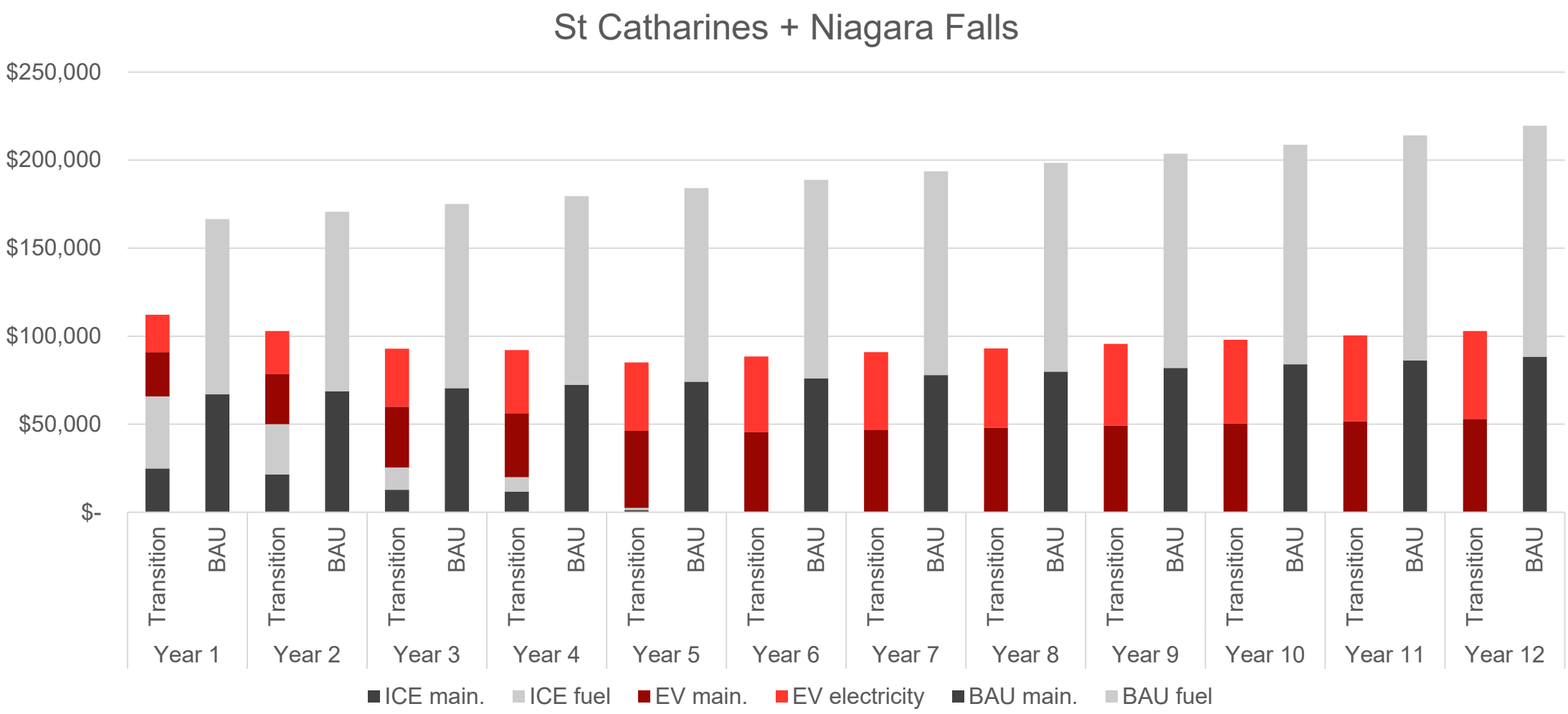
Vans can be fully electrified in the fourth year, fifth year for pickups and sixth year for SUVs.

CAPEX – Combined

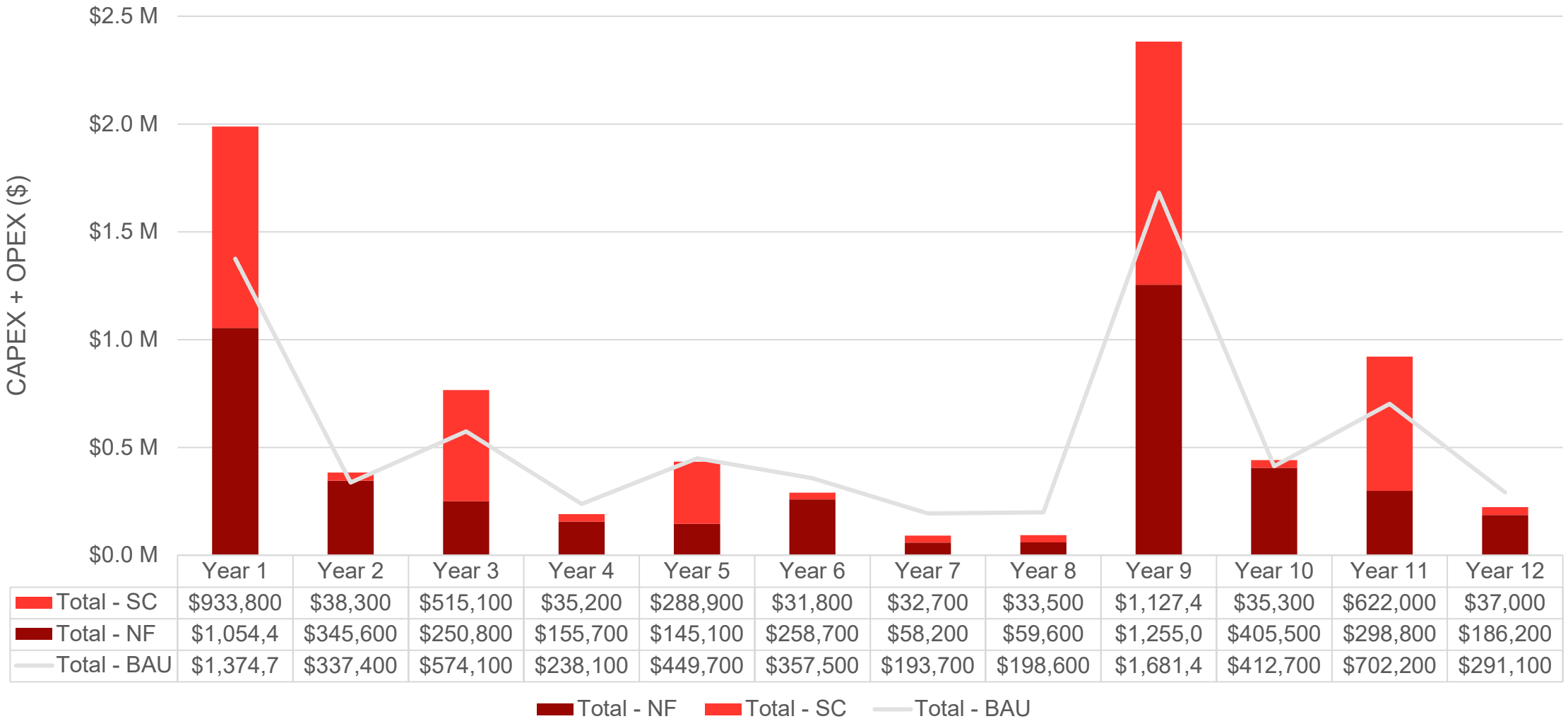


	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Niagara Falls	$979,500	$280,900	$192,200	$98,800	$91,100	$202,000	$-	$-	$1,193,80	$342,800	$234,400	$120,200
St Catharines	$896,500	$-	$480,800	$-	$257,800	$-	$-	$-	$1,093,00	$-	$585,900	$-
BAU Total	$1,208,20	$166,700	$399,000	$58,500	$265,700	$168,800	$-	$-	$1,477,80	$204,000	$488,000	$71,500

OPEX – Combined

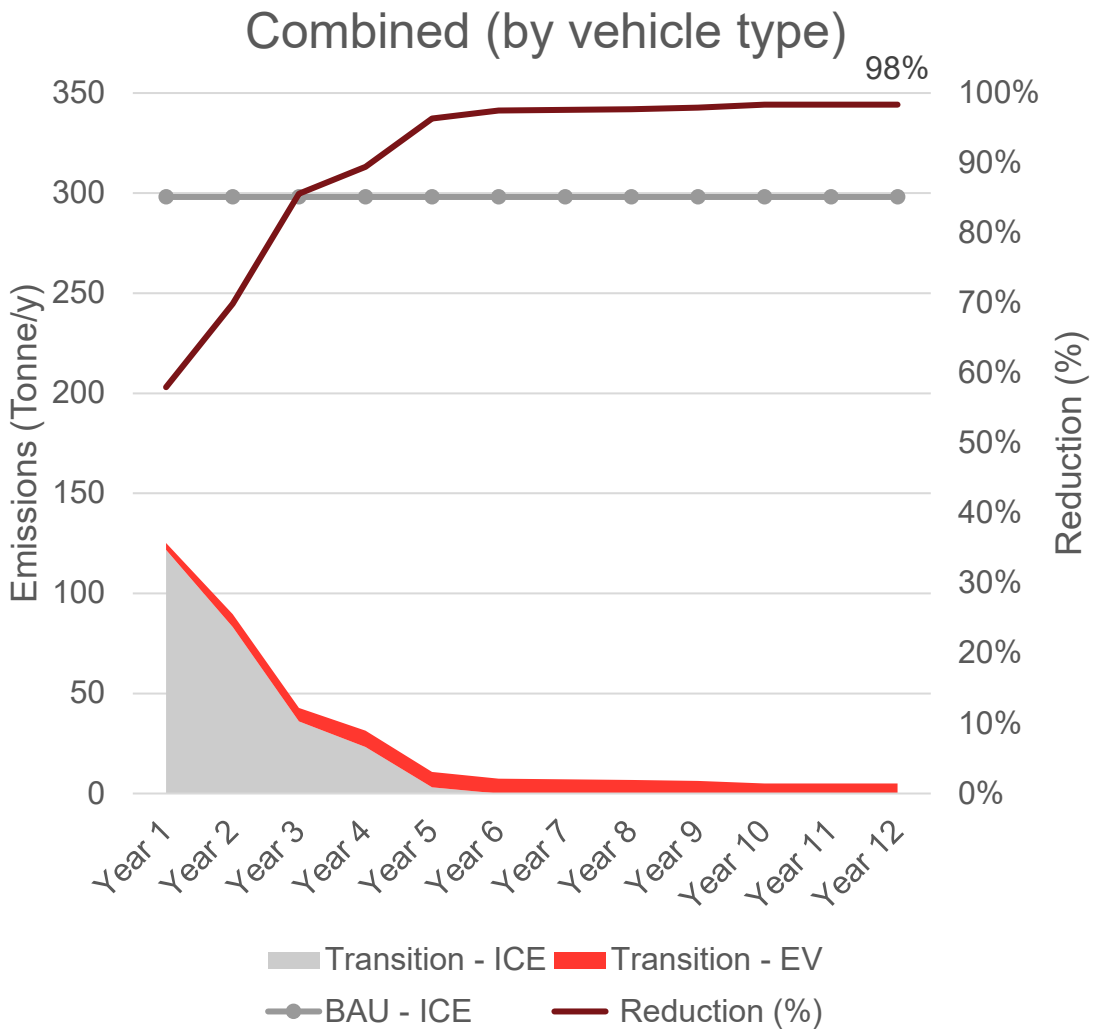


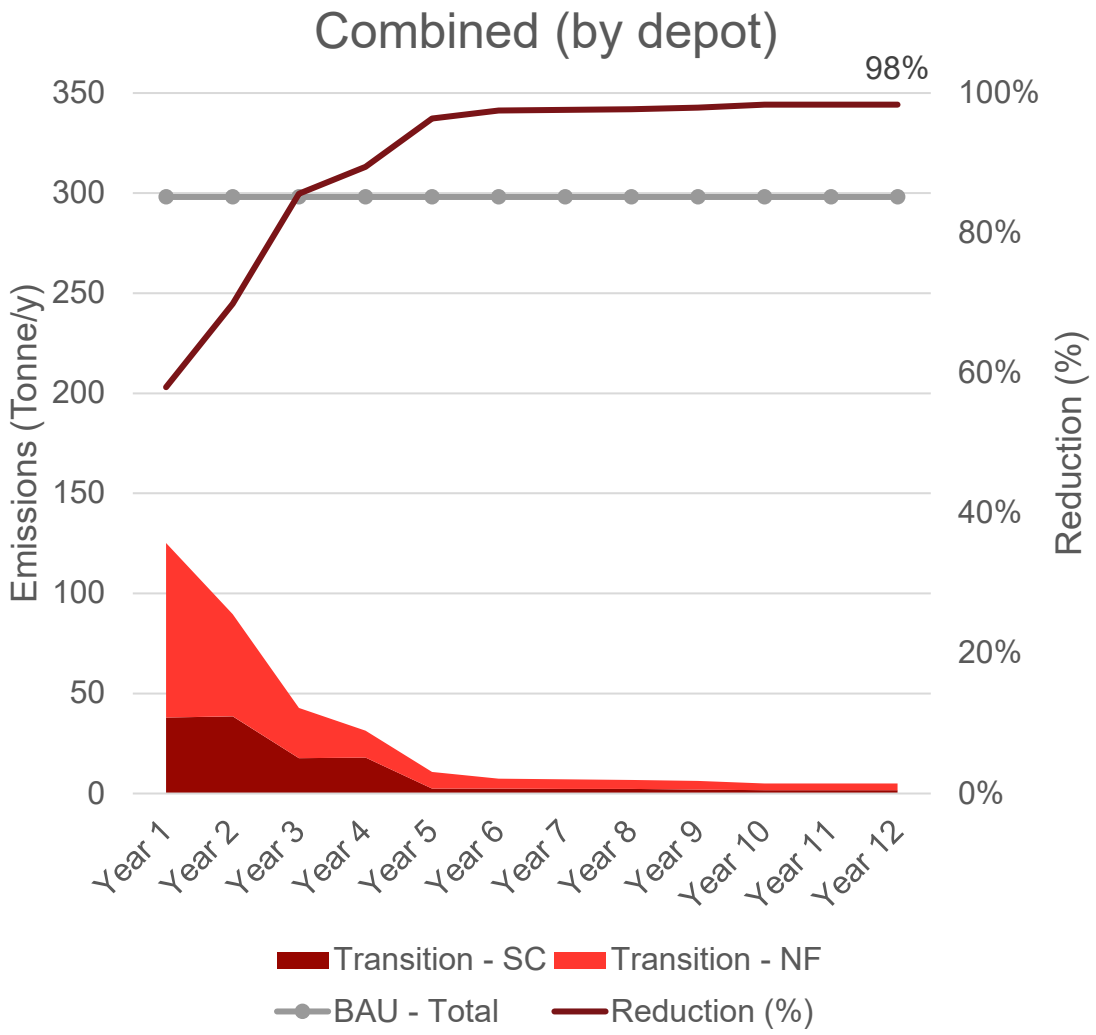
CAPEX+OPEX (Combined)



	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12
Total - SC	$933,800	$38,300	$515,100	$35,200	$288,900	$31,800	$32,700	$33,500	$1,127,4	$35,300	$622,000	$37,000
Total - NF	$1,054,4	$345,600	$250,800	$155,700	$145,100	$258,700	$58,200	$59,600	$1,255,0	$405,500	$298,800	$186,200
Total - BAU	$1,374,7	$337,400	$574,100	$238,100	$449,700	$357,500	$193,700	$198,600	$1,681,4	$412,700	$702,200	$291,100

GHG Emission Reduction – Combined

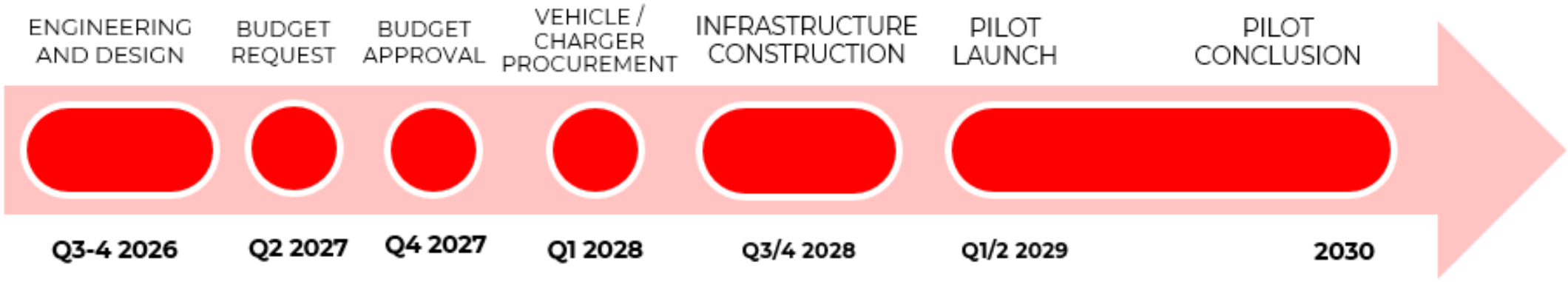




PHASE 3 PILOT: ELECTRIFIED PARATRANSIT VEHICLES

Paratransit Vehicle Electrification Pilot Business Case - Overview

- Phase 3 of the NT Fleet Electrification and Implementation FEED Study involves developing a business case for a demonstration project for deploying a fleet of zero-emission battery-electric paratransit vehicles into NT's Specialized Service, operating in both St Catharines and Niagara Falls garages.
- These vehicles will be introduced in addition to the existing ICE fleet and will not serve as replacements.
- The fleet and infrastructure used for the Pilot are separate from the long-term fleet and facility electrification planning described in the NT Fleet Transition Plan and Roadmap.
- NT will retain full ownership of the vehicles and handle operations, with no involvement from third-party operators.



Paratransit Vehicle Electrification Pilot Business Case

Vehicles to be Used	• Fully accessible battery-electric paratransit vehicles with 10 to 12 seats. • At least 1 unit based at St Catharines garage and at least 2 units based at Niagara Falls garage. (minimum 3 and up to 5 vehicles).
Pilot Duration & Operations	• 4 months minimum, up to 2 years • Pilot will adhere to NT's standard Specialized Service operations (4-hour AM peak shift + 4-hour PM peak shifts) • Dispatch / booking management to be by NT using NT's Specialized Service transit booking and scheduling / dispatch software platform (or equivalent)
Roles & Responsibilities	• Vehicles will be NT-owned • Drivers (operators) will be provided by NT • Charging infrastructure will be procured and operated conventionally by NT or potentially outsourced.
Infrastructure	• 1 Level 3 charger at St Catharines • 1 Level 3 charger at Niagara Falls

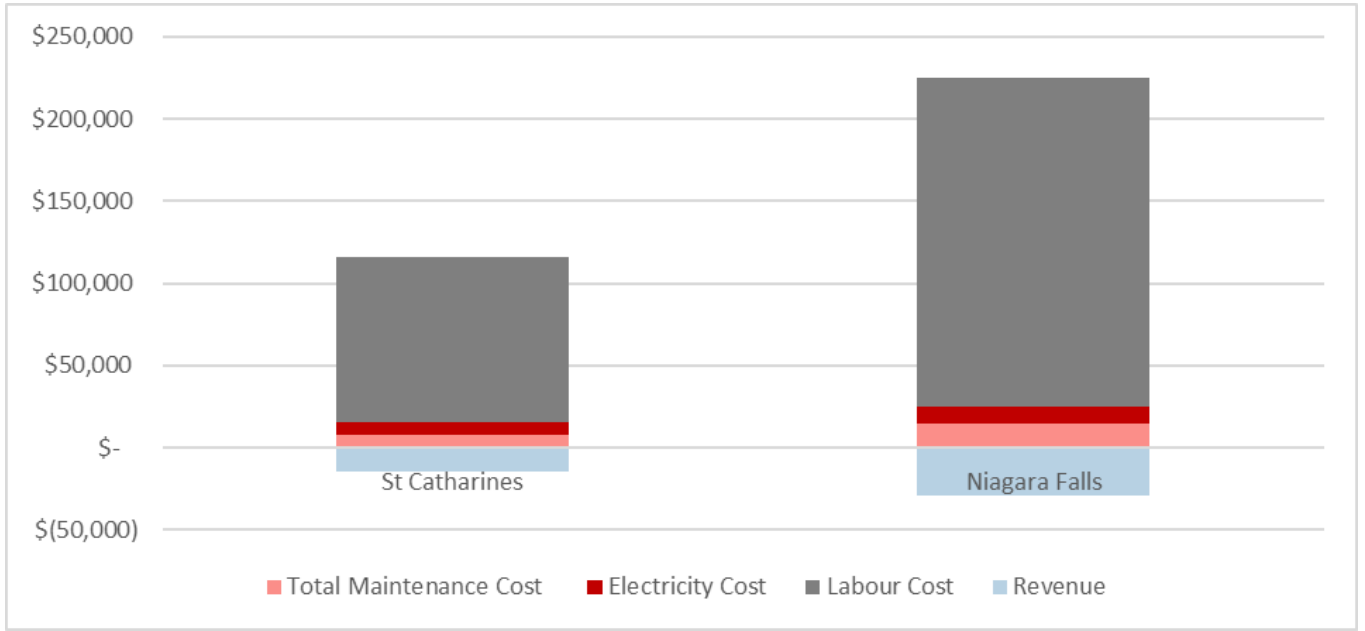
Costs

Capital Costs

	St Catharines			Niagara Falls	
	Unit cost ($)	Count	Subtotal ($)	Count	Subtotal ($)
Vehicle	$219,600	1	$219,600	2	$439,200
Charger Cabinet	$180,000	1	$180,000	1	$180,000
Dispensers	$60,000	1	$60,000	2	$120,000
Installation & Construction	$200,000	1	$200,000	1	$200,000
Total			**$709,600**		**$989,200**

Operating Costs

		St Catharines	Niagara Falls
No. of vehicles and drivers		1	2
Total Maintenance Cost	$/year	$7,468	$14,935
Electricity Cost	$/year	$8,105	$9,811
Labour Cost	$/year	$100,000	$200,000
Forecast Fare Revenue	$/year	($14,553)	($29,106)
Total (without Revenue)	$/year	$115,513	$224,906
Total (with Revenue)	**$/year**	**$100,960**	**$195,799**



ADDITIONAL FINDINGS

Conclusions and Recommendations: Transition Plan

1. Simulations indicate depot-only charging for the St Catharines garage will be appropriate while Niagara Falls garage will require both depot and on-route chargers.
2. A 12-year period is contemplated to transition / electrify NT's fleet.
   a) For the first eight years, the transit fleet replacement should align with the 'business as usual' vehicle replacement schedule, gradually replacing the oldest ICE buses first with BEBs.
   b) In years 9 to 12, it is recommended that to deploy BEBs each year evenly to meet the required total number of core and spare units at each garage.
3. Prior to the 12-year transition, NT should allow for a minimum of a two-year lead time in which to complete detailed design, enabling works and construction of the first phase of retrofits for St Catharines garage.
4. The overall revenue fleet size will increase from 122 to 129 (+6%) for 40-ft buses and from 22 to 35 (+59%) for 60-ft BEBs. Paratransit shuttles will remain unchanged due to their relatively lighter duty cycles.
5. The implementation of a charging management system can be used to reduce electricity cost expenditure by shaving the peak demand.
6. The NT fleet and infrastructure transition roadmap will cost 53% more than business as usual at the St. Catharines facility, and 84% more than BAU for the Niagara Falls facility, and in aggregate, 66% more than BAU for both facilities.
7. A fully electrified revenue fleet is forecast to reduce lifecycle GHG emissions by up to 98% compared to BAU.

Conclusions and Recommendations: Non-Revenue Fleet

1. Niagara Falls has more use of non-revenue vehicles than St Catharines.
2. Vans and SUVs have the least maintenance cost on a per km basis while pickups have the highest.
3. Following the current replacement schedule, NT can achieve 100% electrification of non-revenue vehicles in year six.
4. Vans and pickups should be given higher priority for electrification if the transition schedule can be adjusted because vans are most used and pickups are the least efficient.
5. The chargers should be installed before the vehicles are purchased.
6. The savings from the OPEX of EVs are not enough to cover the extra CAPEX of EVs with current EV prices.
7. NT should pursue government funding for EVs and chargers to cover the extra costs.
8. Both depots can reach 98% GHG emission reduction because of the clean electricity grid in Ontario.
9. As non-revenue EVs do not cause high demand, it is not necessary to have smart charging system just for non-revenue fleet. If it is included in the BEB fleet, then smart charging can reduce the overall electricity cost.