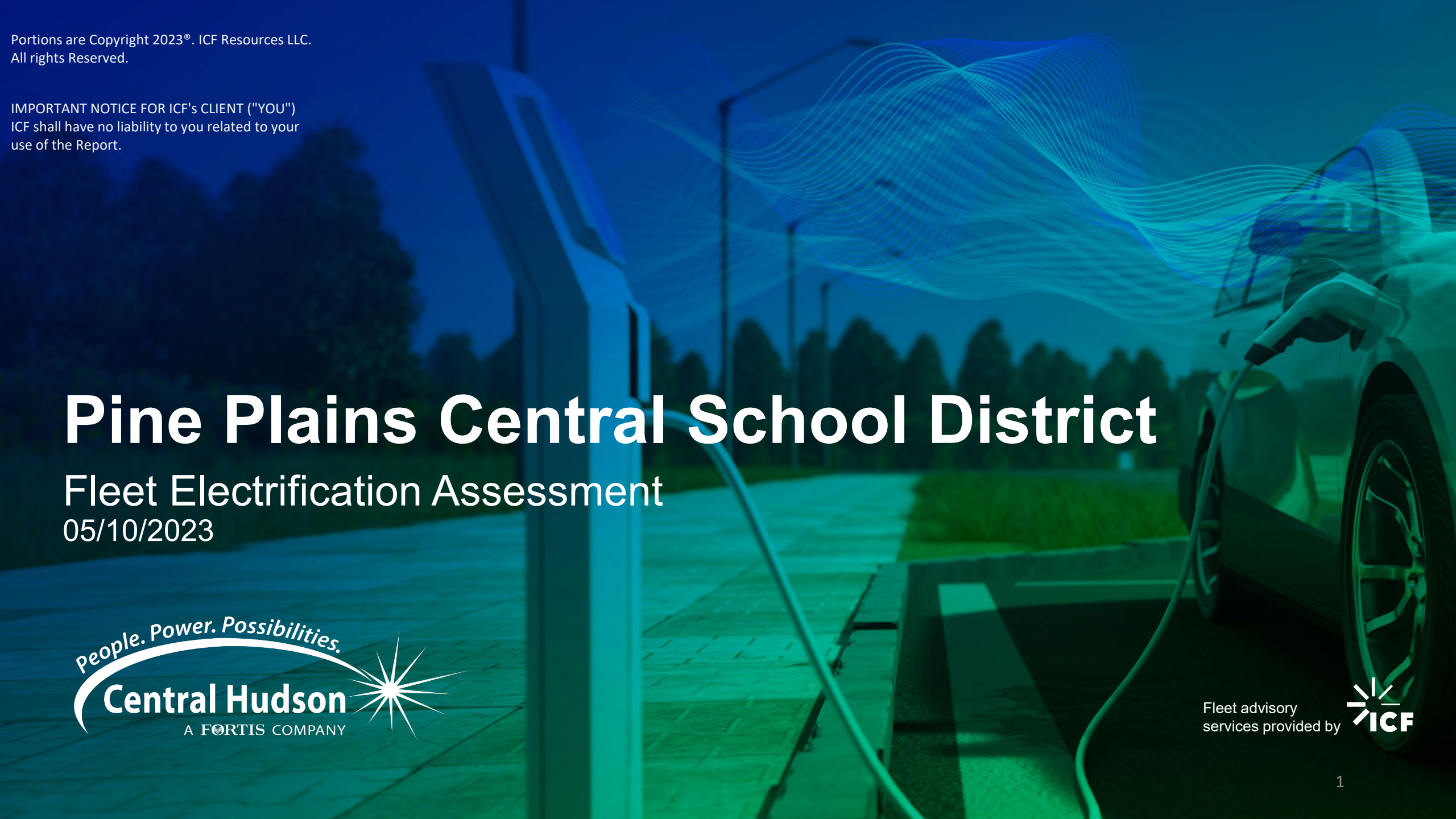


Pine Plains Central School District

Fleet Electrification Assessment

05/10/2023

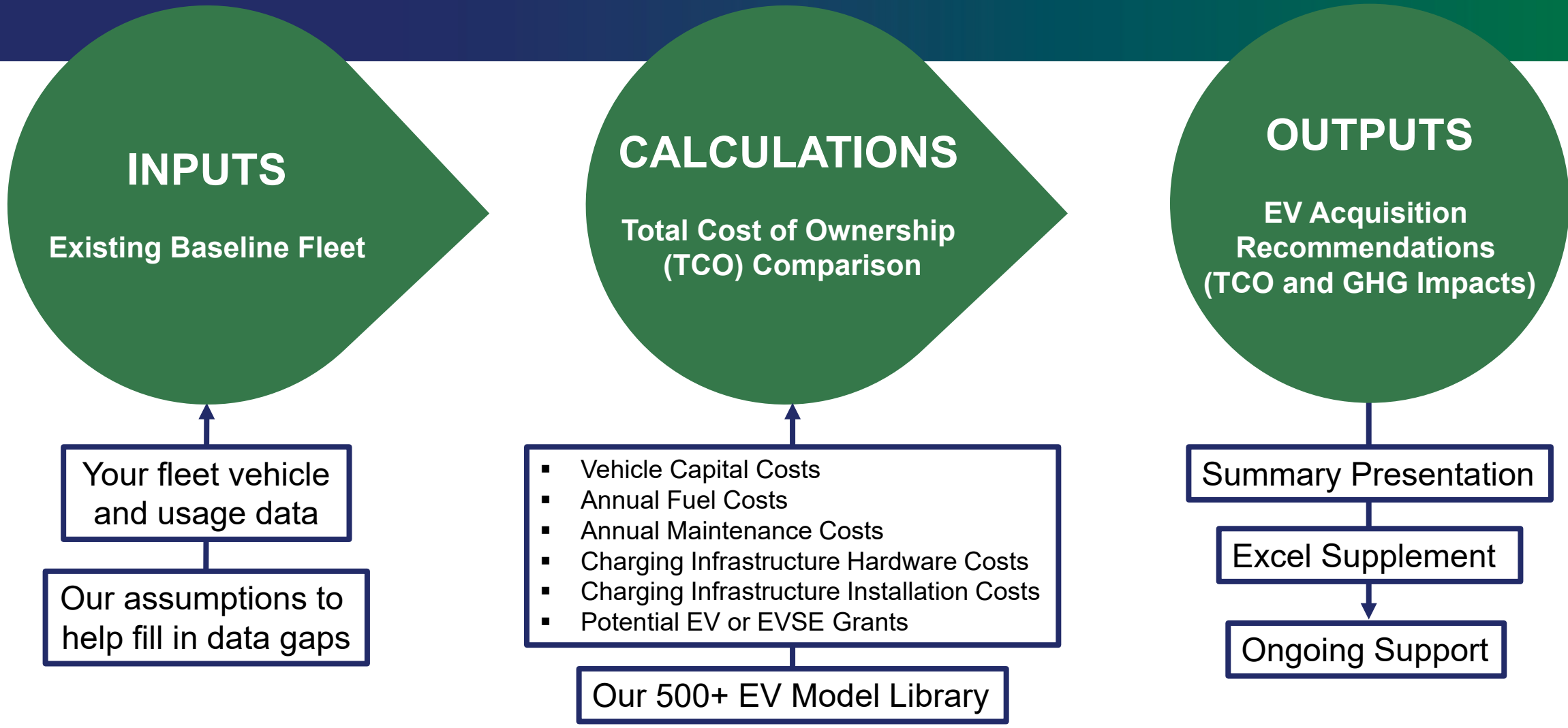
People. Power. Possibilities.
Central Hudson
A FORTIS COMPANY

Fleet advisory services provided by ICF

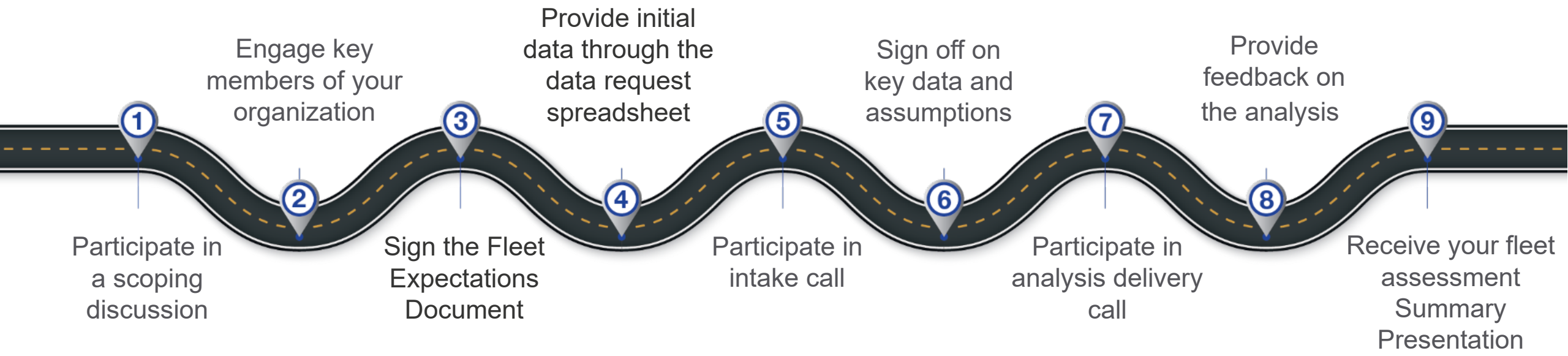
Agenda

- Introductions
- Report Overview
- Rate Analysis
- Site Assessment
- Next Steps

Fleet Assessment Process



Your Program Roadmap to Date



As opportunities or challenges arise, talk to your Account Manager

The road continues with:
- **Technical assistance THROUGH 2025!**

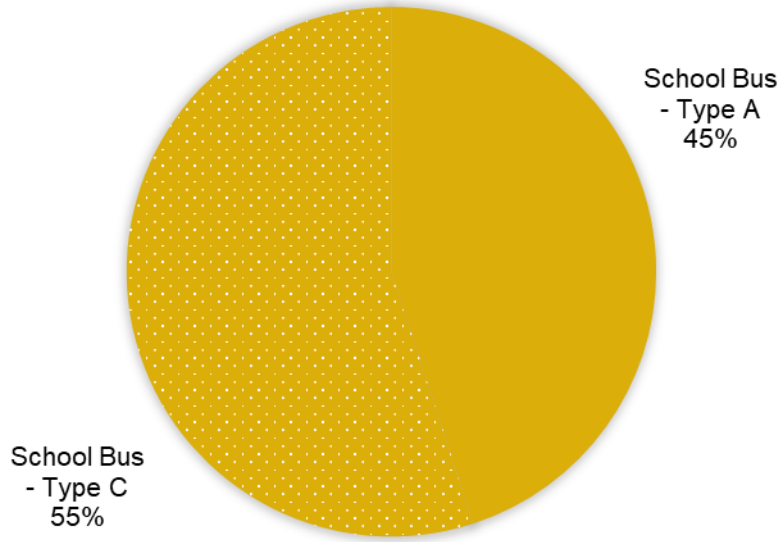
Your Roadmap to Electrification

1. Review your Summary Presentation
2. Ask your Account Manager questions
3. Work with your Account Manager to plan your organization's next steps
4. Present information to stakeholders, including available incentives and the Central Hudson Make-Ready Program
5. Share electrification plans with stakeholders inside and outside your organization
6. Discuss charging infrastructure with Central Hudson
7. Acquire EVs
8. As opportunities or challenges arise, talk to your Account Manager
9. Receive technical assistance through 2025

Existing Fleet

Existing Fleet Fuel Type Distribution		
Vehicle Type	**Gasoline**	**Diesel**
School Bus*	14	6
TOTAL	**14**	**6**

Existing Fleet - Vehicle Types



*The model assumes the engine fuel type for all school buses is diesel.

Key Assumptions*

- **Recommendation Threshold:** EVs recommended for 100% of vehicles when EV equivalent is available and range is sufficient.
- **Vehicle Replacements:** The estimated retirement schedule is primarily based on fleet-provided data.
  - However, when assumptions are used, the estimated retirement schedule is based on the model year and vehicle lifespan as provided by the fleet.
- **Vehicle Ranges:**
  - Annual mileage and average daily mileage were provided for 100% of the vehicles by the fleet
  - Average temperature range of 25 to 75°F to assess potential temperature impact on EV ranges = reduced EV model ranges to 80% of their maximum mileage range.

Vehicle Type Assumptions

Vehicle Type	Vehicle Lifespan	Average Annual Vehicle Mileage
School Bus – Type A	12	25,729
School Bus – Type C	12	20,815

*Additional assumptions detailed in the appendix.

Incentive and Funding Sources (slide 1 of 2)

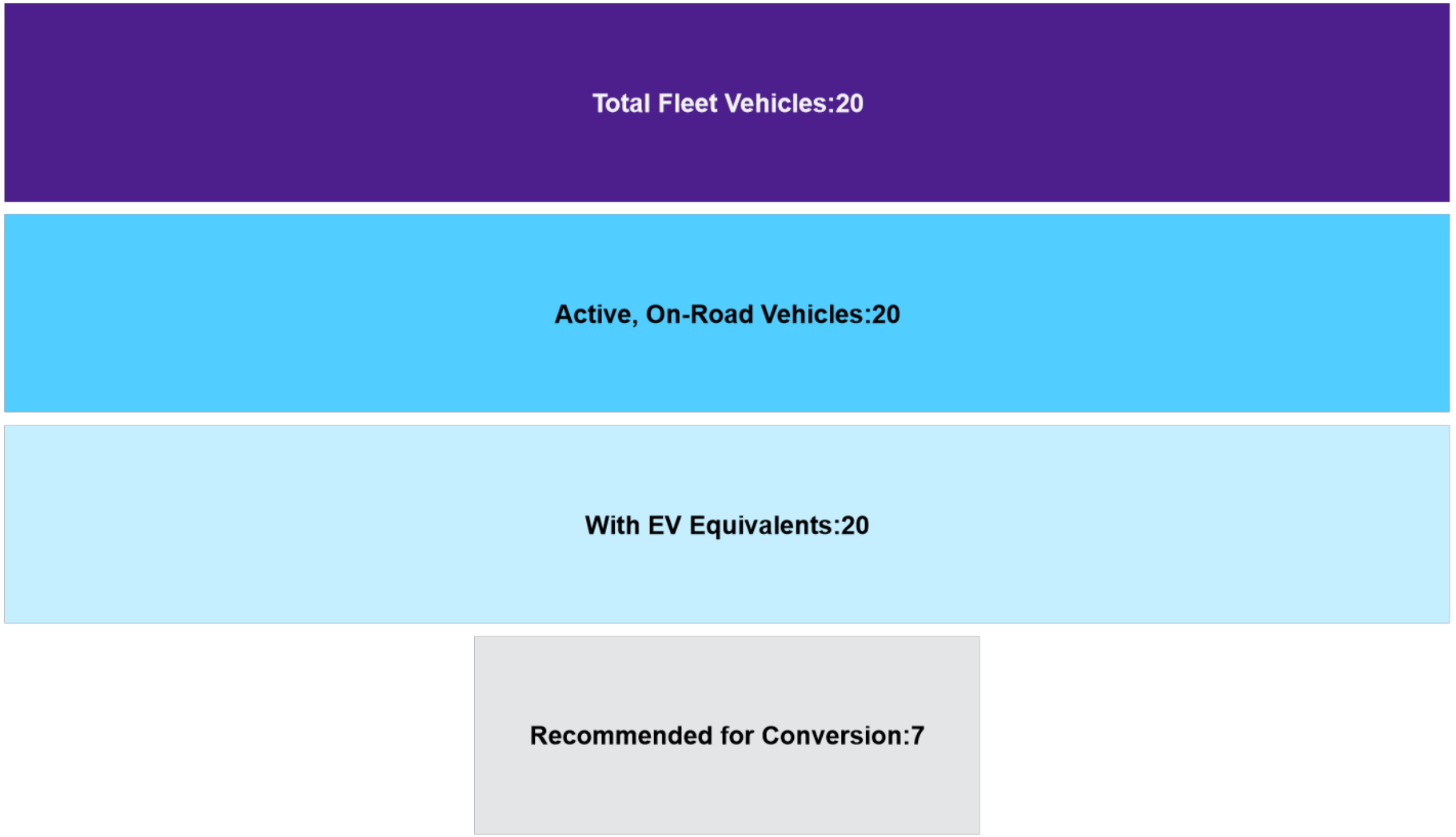
Program	Light Duty	Medium Duty	Heavy Duty	Administrator	Vehicle Costs	EVSE Installation	EVSE Hardware	Program Offerings	Upcoming Deadlines	TCO Funding Assumptions
Diesel Emission Reduction Act (National)		✓	✓	EPA	✓			Up to 45% of EV and EVSE costs, must replace a diesel vehicle with 7,000+ annual miles	TBD	45% of capital costs with 7,000+ annual miles
Clean School Bus Program*			✓	EPA	✓	✓	✓	Up to $190,000 vehicle funding per replaced school bus. Up to $13,000 infrastructure funding per replaced bus.	Application open 5/20/2022 until 8/19/2022	$190,000 vehicle funding and $13,000 infrastructure funding per replaced school bus
NYSERDA New York Truck Voucher Incentive Program			✓	The New York State Energy Research and Development Authority (NYSERDA)	✓			80% - 100% of incremental capital costs, up to $250,000 per vehicle (cap varies by vehicle type)	8/18/2024 for round 2 funding	80% - 100% of incremental capital costs, up to $250,000 per vehicle

*The 2023 cycle opened in April and will close in August 2023. To apply this year, a minimum of 15 buses must be submitted.

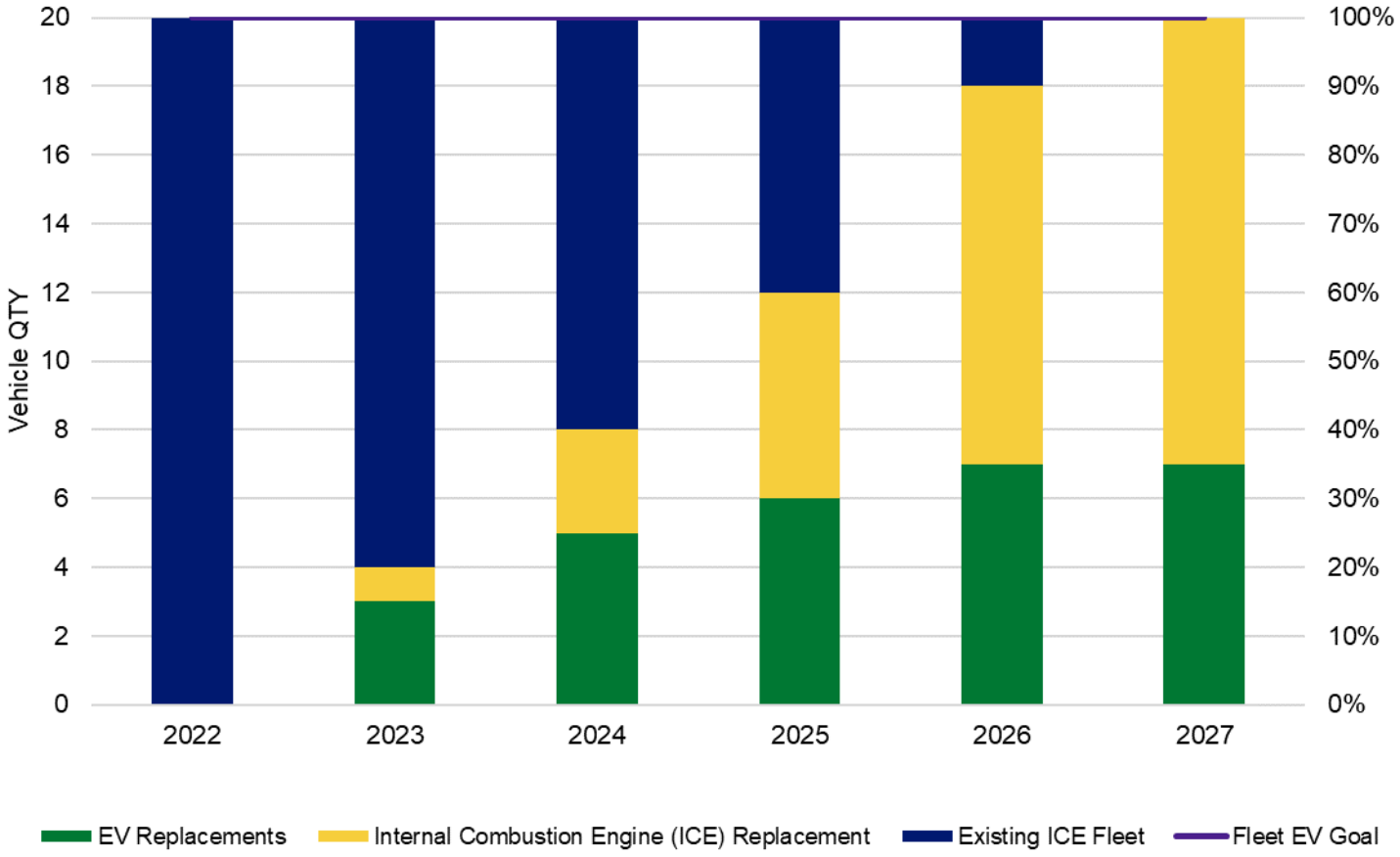
Incentive and Funding Sources (slide 2 of 2)

Program	Light Duty	Medium Duty	Heavy Duty	Administrator	Vehicle Costs	EVSE Installation	EVSE Hardware	Program Offerings	Upcoming Deadlines	TCO Funding Assumptions
Electric Vehicle Infrastructure Make-Ready Program				Central Hudson		✓		50%-100% rebate for EVSE infrastructure costs from the electric distribution system	12/31/2025	50% of EVSE installation costs for EVs purchased before 2026
Direct Current (DC) Fast Electric Vehicle Supply Equipment (EVSE)				Central Hudson		✓		Annual per-plug incentive in support of the development of public DCFC stations	12/31/2025	Not included (charging stations must be publicly accessible)
Non-Residential EVSE Program (Make-Ready)				Central Hudson & Avangrid			✓	50% rebate for L2 and DCFC hardware and covers 50-100% of Make-Ready costs	12/31/2025	$3,000 per plug infrastructure cap

Fleet Assessment Vehicle Breakdown



Recommend Replacement Timeline



All ICE vehicles were assessed for EV replacements; however, EV school bus ranges posed to be the primary limitation for recommendation.

Replacement Timeframe: 2023 - 2027
TCO Analysis Timeframe: 2023 - 2037

Electrification Recommendation Impacts

Based on our analysis, converting 7 vehicles to EVs is estimated to produce the following impacts:

$194,276
TCO savings over **15** years*

$321,275
fuel cost savings over **15** years*

$141,973
maintenance savings over **15** years*

2,213
metric tons (MT) of CO2 eliminated over **15** years

Over 15 years, those estimated CO2 reductions equate to:

eliminating **254** homes' energy use for one year, or:

switching **84,087** incandescent lamps to LEDs, or:

recycling **752** tons of waste instead of landfilling it, or:

planting **36,512** trees.

* NPV assumes a 5% discount rate.

Electrification Recommendations

5-Year Electrification Recommendations							
Vehicle Type	**Quantity Up for Retirement (in 10 Years)**	**Quantity Recommended to Convert to Electric**	**Recommended Make/ Model/ EV Type**	**Financial Savings** (across 15 years)	**GHG Emission Reductions** (across 15 years, MT)	**EVSE**	
						L2	**DCFC**
School Bus	20	1	IC Bus/chargE Type C CE Series/BEV	$31,143	207	1	-
		2	Thomas Built/Saf-T-Liner eC2 Jouley School Bus/BEV	$70,262	699	1	1
		4	Unique Electric Solutions (UES)/International PC105 School Bus/BEV	$92,870	1,308	3	1
TOTAL	**20**	**7**		**$194,276**	**2,213**	**5**	**2**

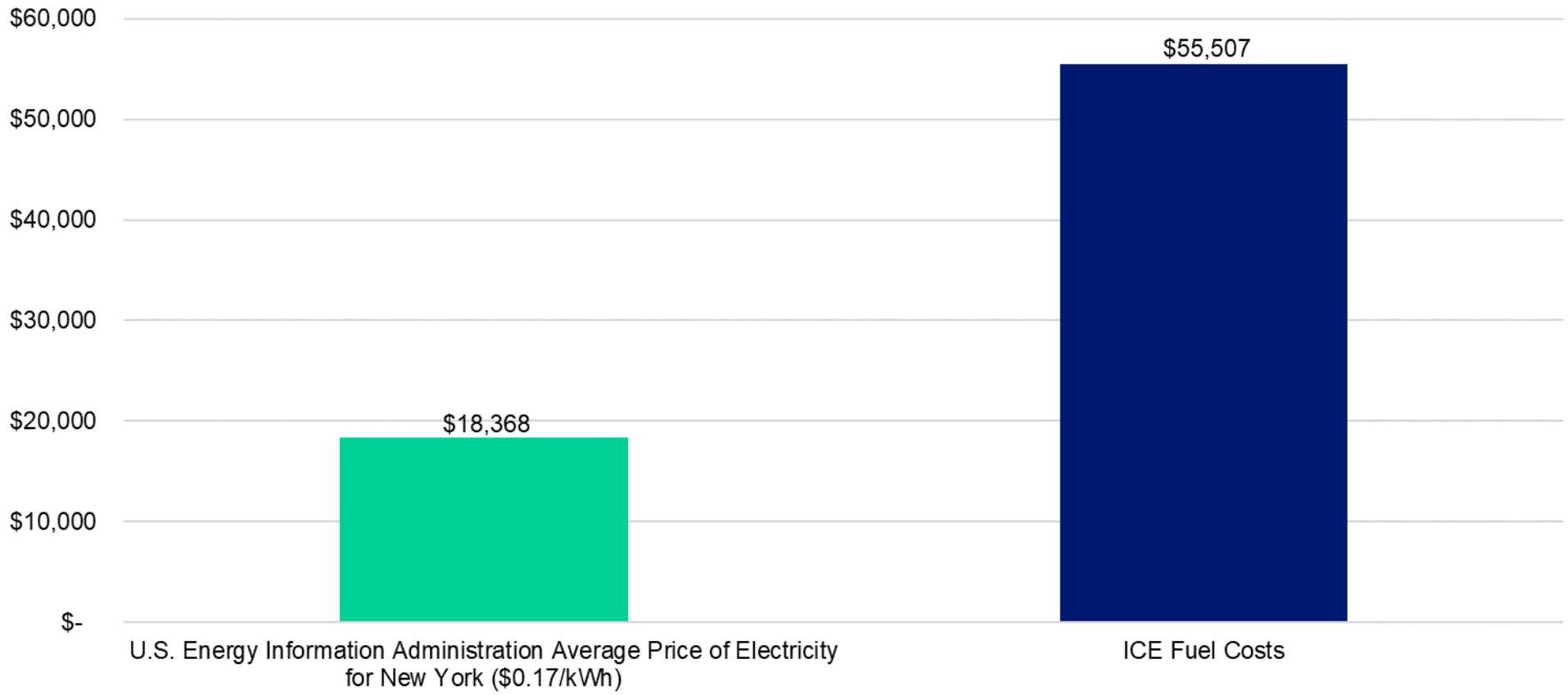
Charger Recommendations

Charging Level	Charger Nameplate Demand (kW) Range	Number Recommended	Total Equipment Cost	Total Installation Cost	Description	Typical Light-Duty Range and Charge Times
Level 2 Chargers (L2)	12-15 kW	1	$1,905	$3,333	Use a 208 V (commercial) or 240 V (residential) AC split phase service	10-20 miles of range per hour (4-6 hours for full charge)
	15-19 kW	4	$9,189	$12,865		
DC Fast Chargers (DCFC)	50 kW	2	$50,162	$48,554	Use 208 V or 480 VAC, three-phase service connection requiring a dedicated circuit	60-80 miles in 20 minutes of charging (~0.5 hours for full charge)
		7	**$61,256**	**$64,752**		

Site Assessment: Site Load Impact Analysis

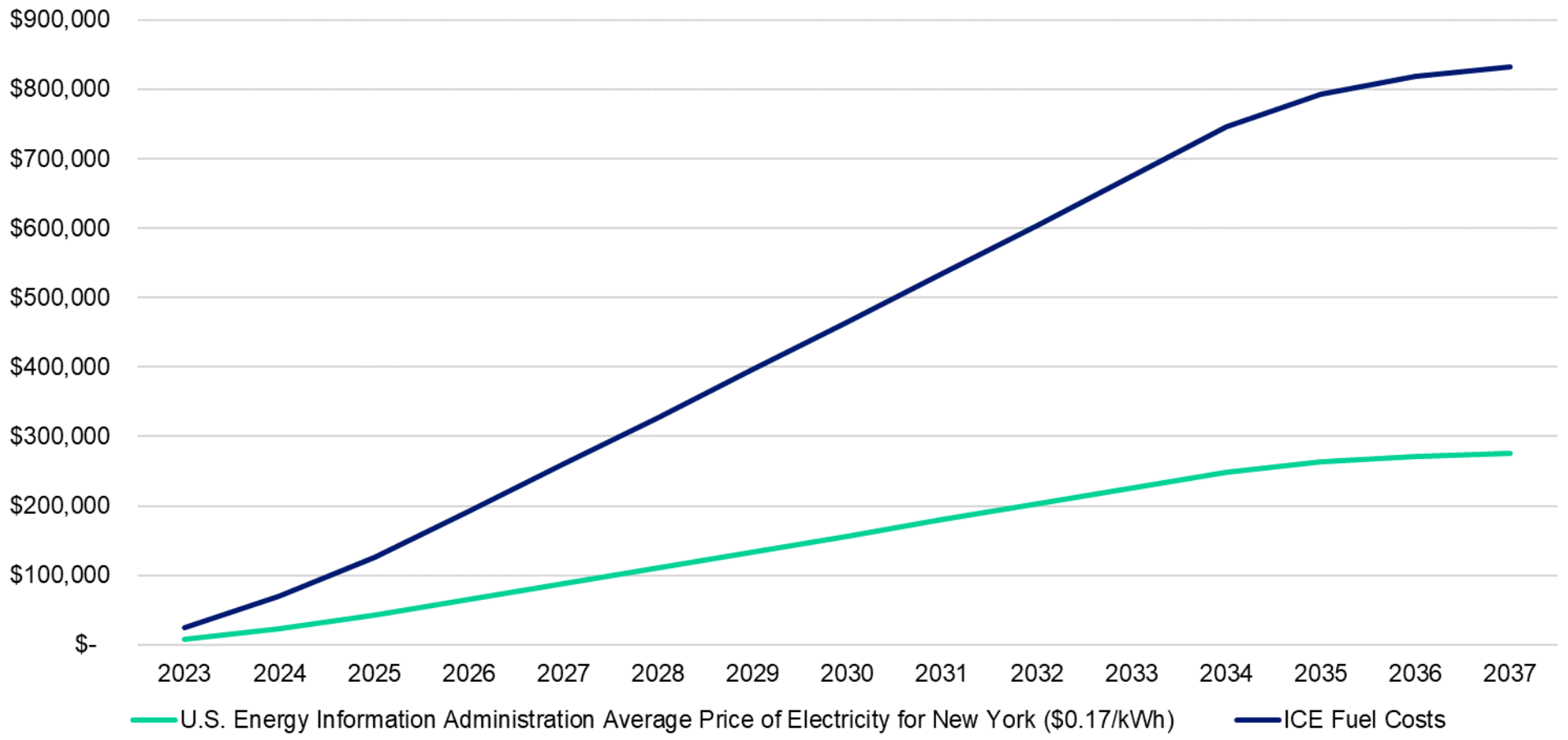
Vehicle Type	L2	DCFC	Assumed Unit Power Demand (kw)	Estimated Total Power Demand (kW)	Potential EV Make-Ready Incentive*
PPCSD Transportation	5	2	124	191	50%
TOTAL	**5**	**2**	**124**	191	

Rate Analysis: Average Annual Fuel Cost Comparison



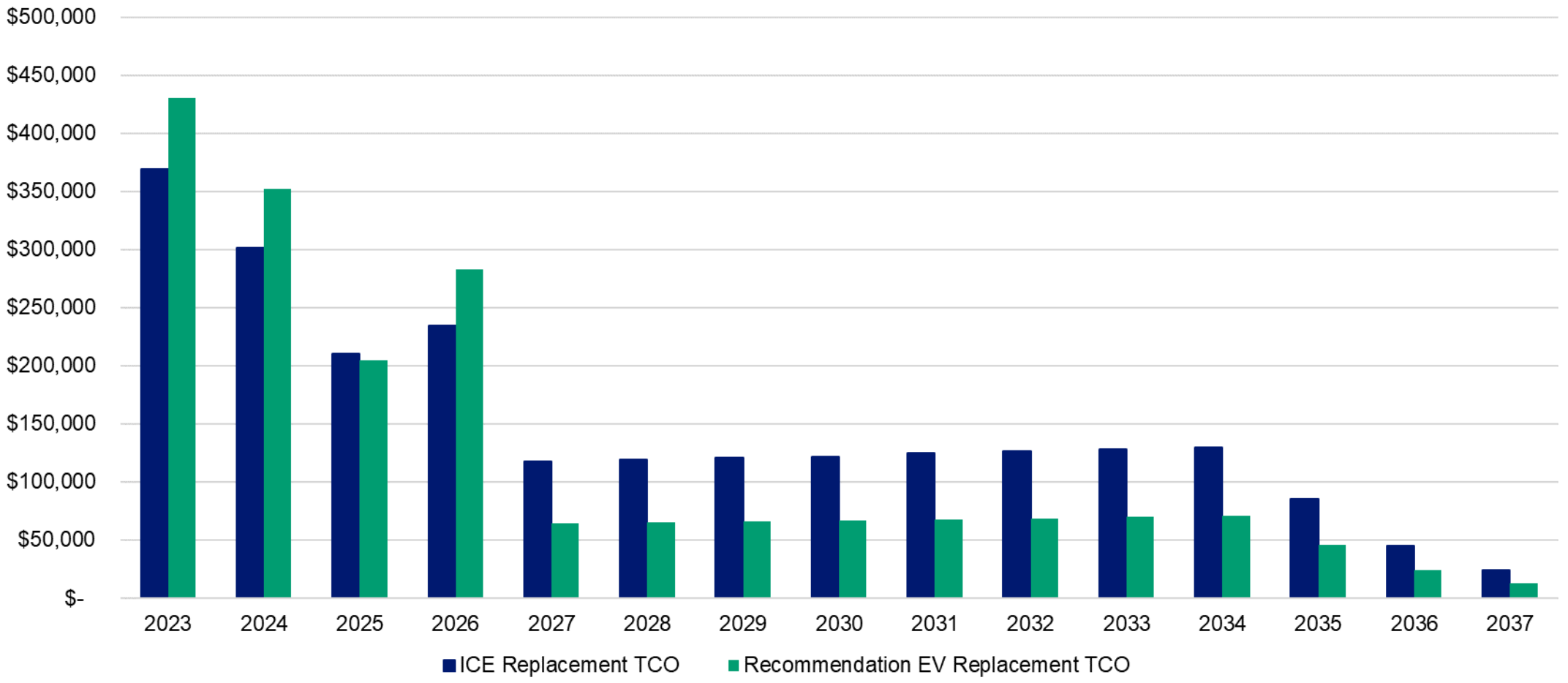
The above comparison summarizes the annual fuel costs for the 7 vehicles recommended for conversion, comparing average electric rates to business as usual (current gasoline or diesel) costs.

Rate Analysis: Cumulative Fuel Cost Comparison

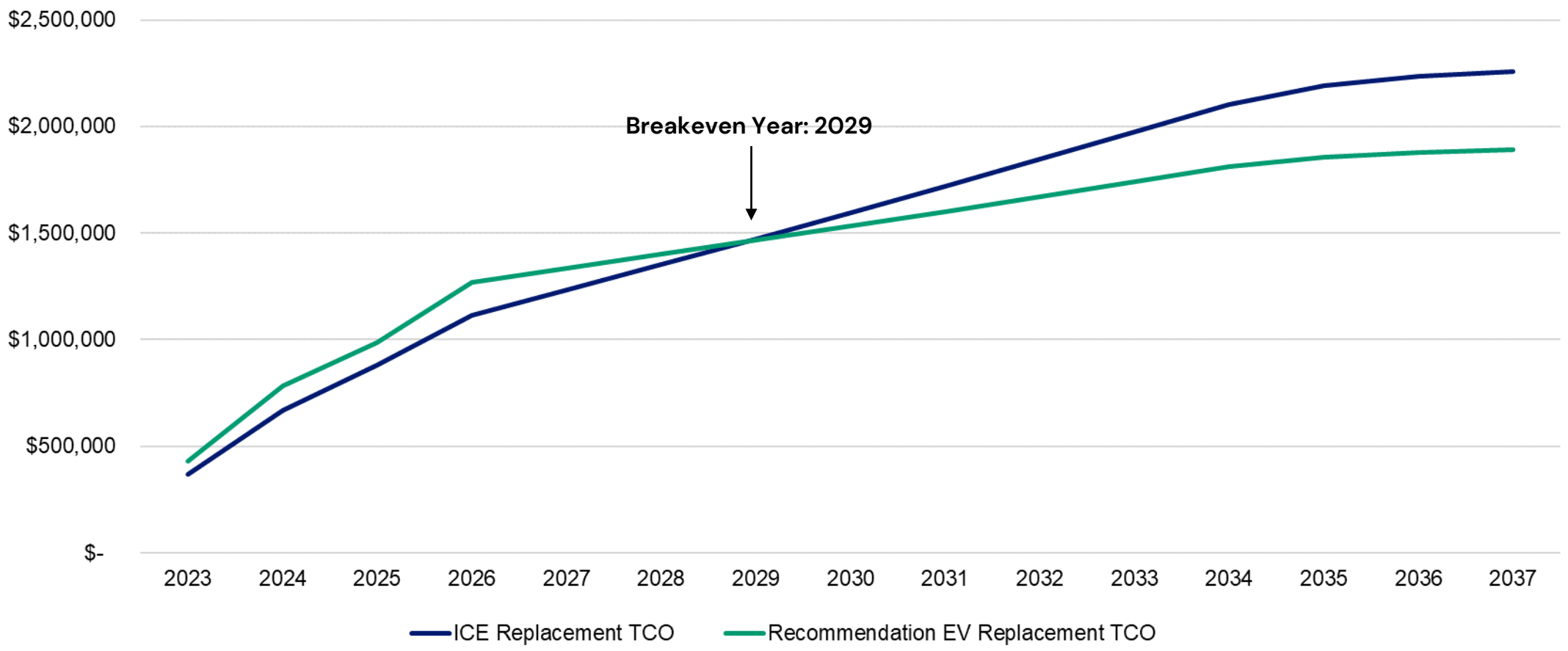


The above comparison summarizes the cumulative fuel costs for the 7 vehicles recommended for conversion, comparing average electric rates to business as usual (current gasoline or diesel) costs.

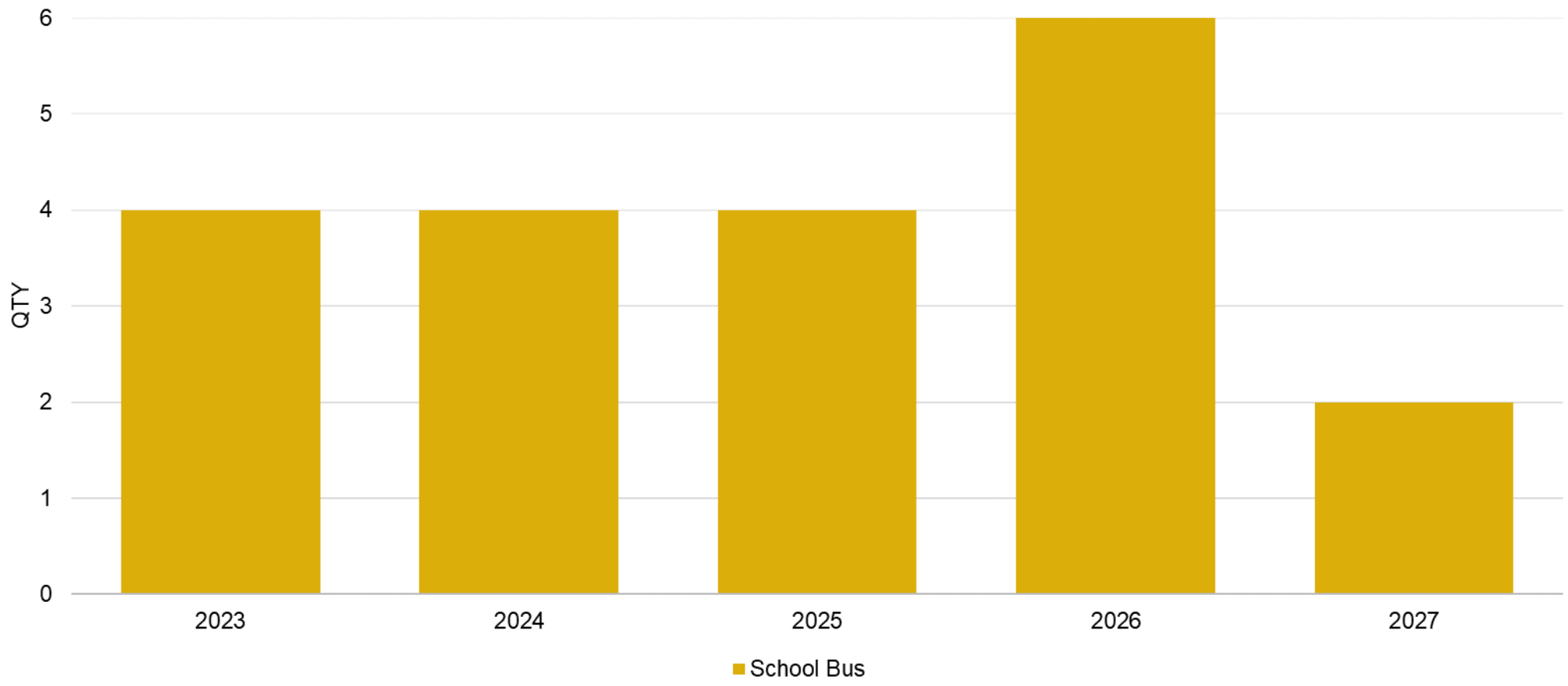
Total Cost of Ownership Comparison



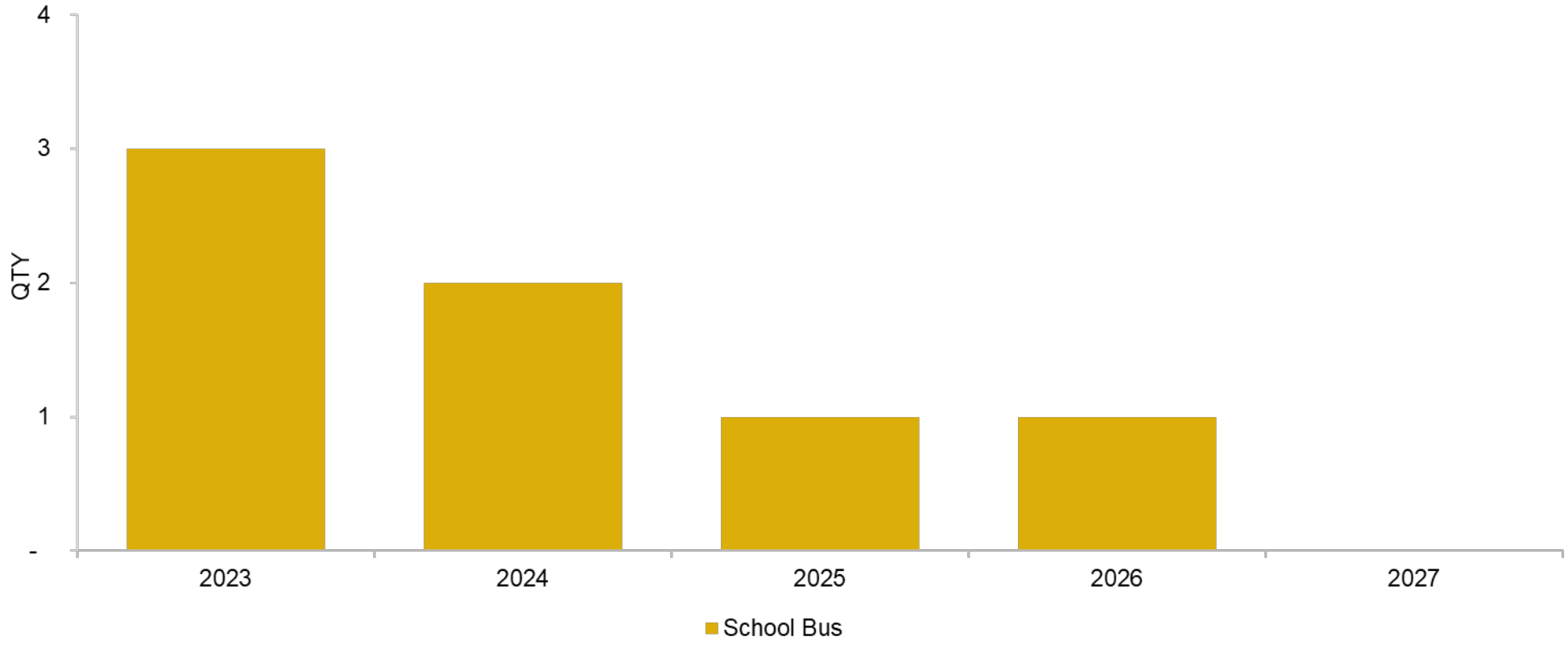
Total Cost of Ownership Comparison



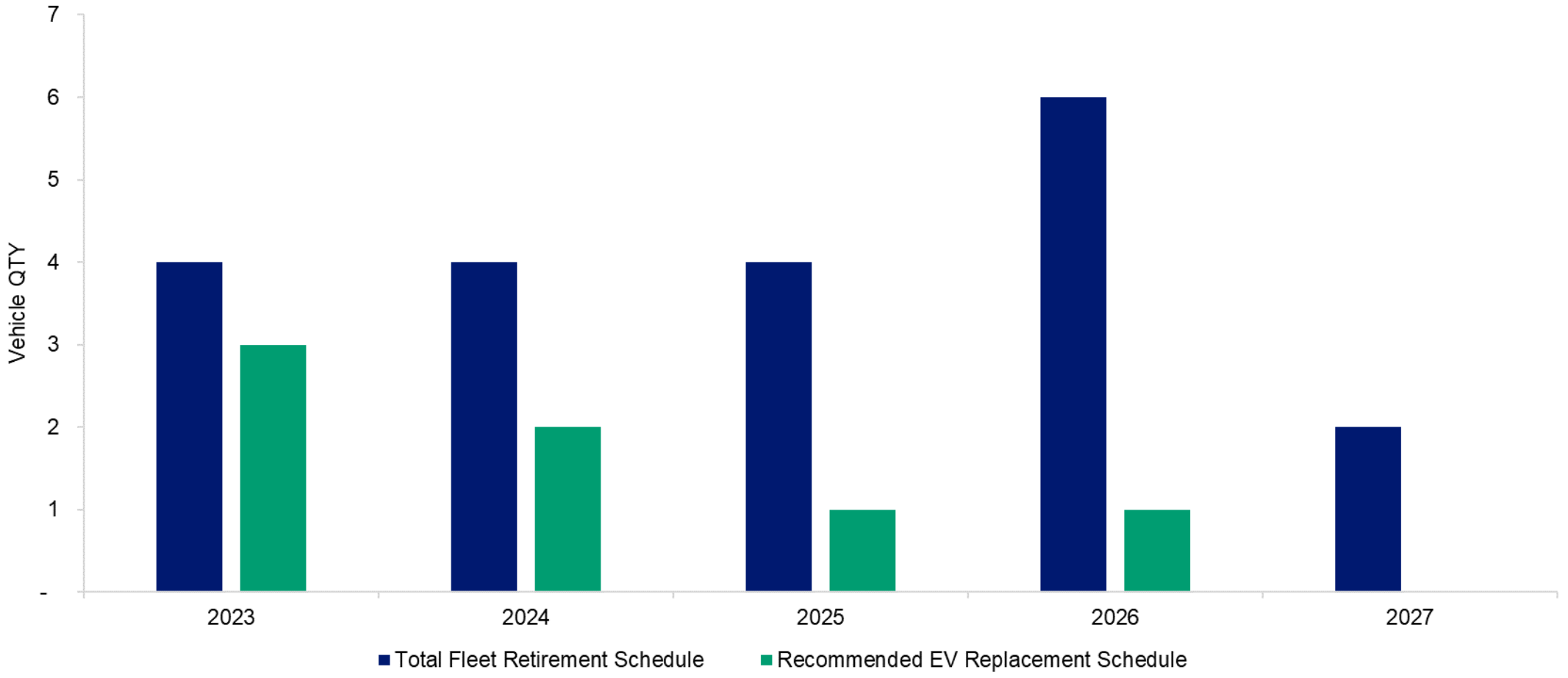
Existing Fleet Retirement Schedule



Recommended EV Replacement Schedule

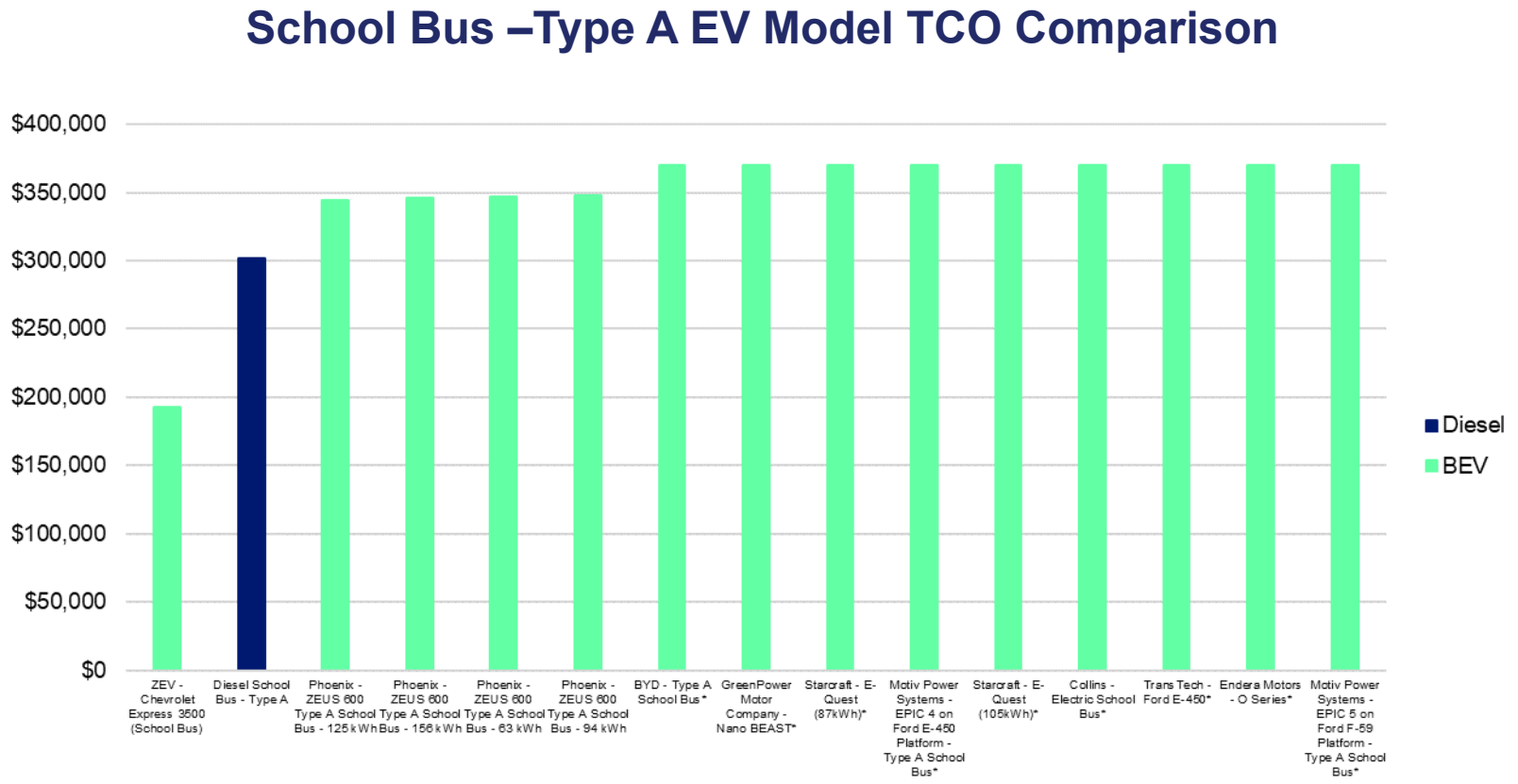


Retirement and EV Replacement Timelines



EV Model Comparison

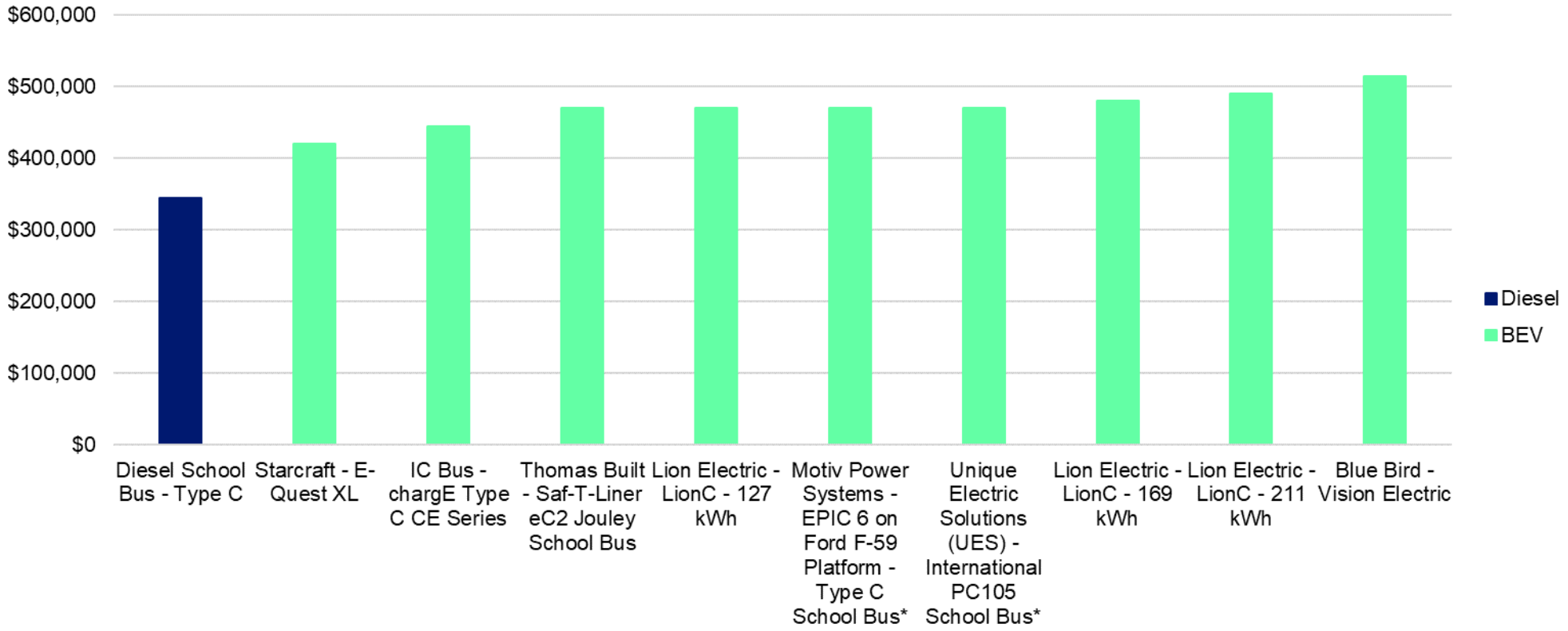
- Over 500 EV models in our EV library used for comparison
- Our EV acquisition recommendations are based on the model with the lowest TCO available that fits your fleet's needs



*Actual MSRP unavailable. Price assumptions are outlined in the Key Assumptions section of the Appendix.

EV Model Comparison

School Bus – Type C EV Model TCO Comparison



*Actual MSRP unavailable. Price assumptions are outlined in the Key Assumptions section of the Appendix.

Fleet Environmental Impact Analysis

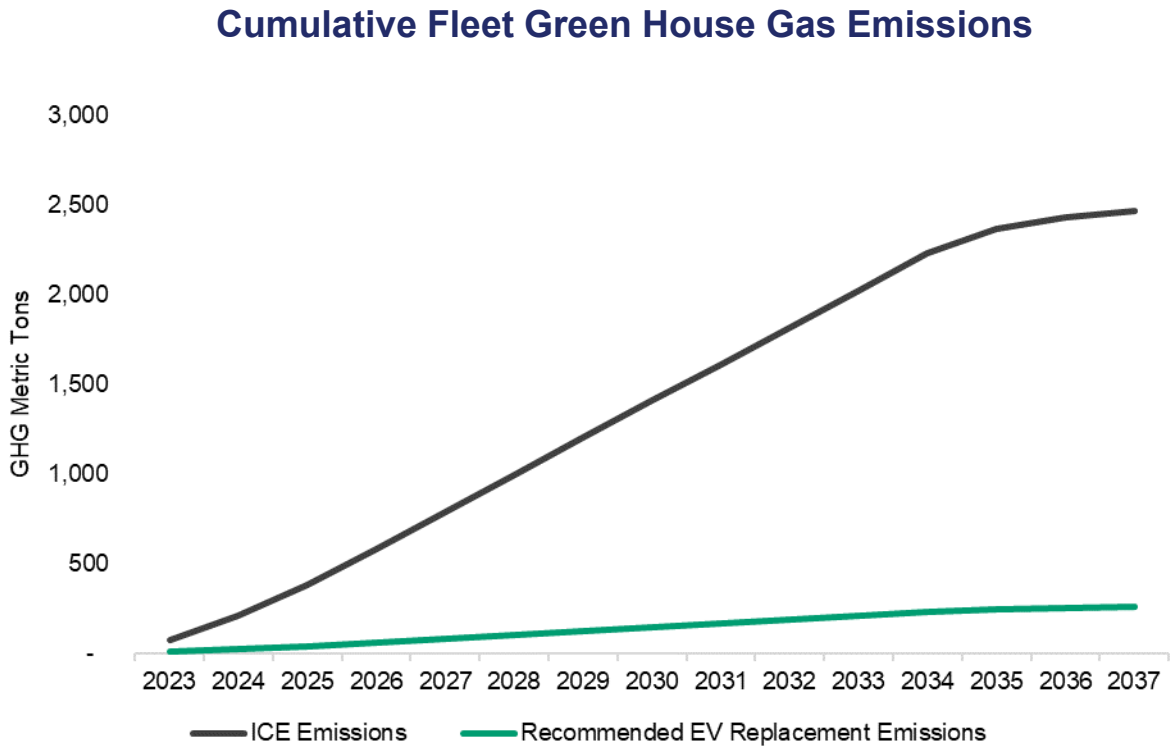
By converting the 7 recommended vehicles to EVs:

2,213 GHG Emission Reductions (MT over 15 years)

6,235 NOx Emission Reductions (Lbs. over 15 years)

478 Equivalent to removing passenger vehicles from the road for one year

36,512 Equivalent to tree seedlings grown for 10 years



Next Steps

Get Support

Have questions about this report? Contact your Account Manager to discuss challenges and answer questions.

Explore Resources for Electrifying.

Move Forward with Electrifying Your Fleet.

Circulate the findings of this report with key stakeholders in your organization. Contact your Account Manager for additional support in preparing to present these findings and incorporate them into your planning.

We're here to help. Contact us for help with your report, support navigating next steps, or just to speak with an expert.

Web: https://www.cenhud.com/en/my-energy/electric-vehicles/EV-make-ready-program/ **Email:** andrew.balon@icf.com **Phone:** 504-635-4013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THANK YOU

Appendix

- Assessment Assumptions
- Supplemental Info:
  - School Buses Not Recommended
  - Vehicles Types Excluded from Analysis
  - Alternative Bus Acquisition Options
  - EV School Bus Ranges
  - Mandate Hardships

Assumptions (1 of 2)

- **Recommendation Threshold**: EVs are recommended for 100% of vehicles when EV equivalent is available, and range is sufficient.
- **Vehicle Pricing**: The model uses manufacturer suggested retail prices (MSRPs) for EVs where available. When MSRP pricing is unavailable, the model uses average pricing based on vehicle and fuel type based on Argonne National Laboratory's Alternative Fuel Life Cycle Environmental and Economic Transportation (AFLEET) Tool and ICF's Comparison of Medium- and Heavy-Duty Technologies in California report for the California Electric Transportation Coalition. Vehicle pricing was escalated annually using the U.S. Energy Information Administration's (EIA) 2022 Annual Energy Outlook (AEO) and ICF's *Comparison of Medium- and Heavy-Duty Technologies in California* report for the California Electric Transportation Coalition.
- **Fuel and Maintenance**: The model uses the U.S. EIA's average gasoline and diesel prices in New York for the past five years, which is $3.14per gallon of gasoline and $2.75 per gallon of diesel. The model determines the average annual fuel use for each vehicle based on its average annual mileage and average fuel economy (miles per gallon), and then multiplies the fuel use value by the price per gallon of fuel. ICF uses annual mileage and fuel efficiency assumptions by vehicle and fuel type from Argonne National Laboratory's Alternative Fuel Life Cycle Environmental and Economic Transportation (AFLEET) Tool and ICF's *Comparison of Medium- and Heavy-Duty Technologies in California* report for the California Electric Transportation Coalition. The model also uses these sources to estimate average per mile maintenance costs based on vehicle and fuel type. Maintenance costs were escalated 2% annually.
- **Electricity Pricing**: The model uses the fuel pricing from the U.S. Energy Information Administration (EIA) for the ICE and EV TCO comparison. Electric rates are assumed to be $0.17/kWh. Electric rates are escalated annually using projections from the U.S. EIA's 2022 AEO Reference Case for Transportation: Electricity.

Assumptions (2 of 2)

- **Vehicle Replacements**: The model uses the vehicle lifespan assumptions by vehicle type in AFLEET to estimate the vehicle retirement schedule. The vehicle lifespan was added to the model year to determine the replacement year, with the minimum being 2023.
- **Timeframe**: This analysis focuses on vehicle replacements for 2023 through 2027, with TCO calculations extending out across the vehicle lifespans to 2037.
- **Discount Rate**: 5% was used for NPV calculations.
- **Vehicle Ranges**: The EV mileage ranges per charge were accounted for when recommending vehicle replacements. The analysis used an average temperature range of 25° to 75° F to assess the potential impact temperatures can have on EV ranges; this reduced EV model ranges to 80% of their maximum mileage range. For Pine Plains Central School District's current vehicles, the model uses AFLEET assumptions by vehicle type to estimate the range required each day; this varies from 50 to 150 miles per day depending on the vehicle type.
- **Electric Vehicle Supply Equipment (EVSE) Pricing and Incentives**: The EVSE pricing assumptions and incentive program amounts applied in the analysis are detailed on the next slide. We assume that chargers are non-networked. Incentives and Funding Source Assumptions are described in an earlier slide of the presentation.

School Buses

Thirteen (13) school buses were not recommended due to insufficient range of current EV models.

Vehicle ID	Make, Model & Year	Typical Mileage Per Day in Use	Current Mileage
223	Blue Bird, All American, 2015	166	152,554
231	Collins, Chevrolet, 2015	144	132,888
233	Blue Bird, Microbird, 2015	335	148,716
240	Blue Bird, Vision, 2018	192	122,823
242	Blue Bird, Vision, 2018	187	92,889
243	Blue Bird, Vision, 2020	145	71,891
246	Blue Bird, Microbird, 2018	161	115,098
247	Blue Bird, Microbird, 2019	165	47,470
248	Blue Bird, Microbird, 2019	211	62,527
250	Blue Bird, Microbird, 2020	176	45,136
251	Blue Bird, Microbird, 2020	159	62,745
252	Blue Bird, Microbird, 2020	129	39,128
253	Blue Bird, Microbird, 2020	159	50,266

Vehicle Types Excluded from Analysis

The nineteen (19) vehicles summarized below were excluded from this analysis, as they are inactive/backup buses.

Vehicle ID	Make, Model & Year
209	Blue Bird, Microbird, 2011
213	Blue Bird, All American, 2012
214	Blue Bird, All American, 2013
215	Blue Bird, All American, 2013
220	Dodge, Caravan, 2014
221	Dodge, Caravan, 2014
227	Blue Bird, Vision, 2015
229	Collins, Ford, 2015
230	Collins, Chevrolet, 2015
232	Blue Bird, Microbird, 2015

Vehicle ID	Make, Model & Year
235	Collins, Ford, 2017
236	Collins, Ford, 2017
237	Collins, Chevrolet, 2017
238	Collins, Chevrolet, 2018
239	Collins, Chevrolet, 2018
255	Blue Bird, Microbird, 2020
256	Blue Bird, Microbird, 2020
257	Blue Bird, Vision, 2023
258	Blue Bird, Vision, 2023

Alternative Bus Acquisition Options

Buy America-compliant buses
- See table on right

Subscription Services
- Mileage-based electric school bus subscription service for vehicles and charging infrastructure
- **Case Study**: Highland Electric Fleets

Bus Type	Make/ Model	Buy America Compliant
Type A	Phoenix ZEUS 600 (63, 94,125, 156 kWh)	✓
	BYD Type A	✓
Type C	Thomas Built Saf-T-Liner eC2	✓
Type D	BYD Type D	✓

EV School Bus Ranges

School Bus Make	School Bus Model	EV Ranges (miles)
Blue Bird	**Micro Bird G5 Electric (Type A)**	100
	Vision Electric (Type C)	120
BYD	**Type A School Bus**	140
Lion Electric	**LionA - 168 kWh (Type A)**	150
	LionA - 84 kWh (Type A)	75
	LionC - 127 kWh (Type C)	100
	LionC - 169 kWh (Type C)	125
Phoenix	**ZEUS 600 Type A School Bus - 125 kWh**	130
	ZEUS 600 Type A School Bus - 94 kWh	100
Starcraft	**E-Quest (87kWh) (Type A)**	100
	E-Quest (105kWh) (Type A)	130
	E-Quest XL (Type C)	105
ZEV	**Chevrolet Express 3500 (Type A)**	110

Mandate Hardships

- State mandates are becoming increasingly prevalent, but their success is contingent on adequate planning and funding from federal, state and utility partners.
- We can expect that deadlines for fleet conversion will be pushed back if there isn't sufficient capability for fleets to actually convert.
- For Pine Plains, 13 vehicles drive a daily mileage that surpasses the range of existing electric school buses. The battery market is quickly developing and more options with extended range are expected to enter the market in coming years. However, at this point in time, it is a barrier to the mandate.
- Buses are one of the best candidates for electrification. They are the most streamlined use of resources (multiple passengers per ride); they have routine charging cycles. Many fleets will purchase L2s for their whole bus fleet to allow for managed overnight, cheaper charging. And then have a few DCFCs on hand for extra charge when needed.
- One recommendation to overcome the range insufficiency is to start with the first year of replacements and replace the most routinely operational buses. Field trip buses and other exceptions can come later.