METROWEST SCHOOL FLEET ELECTRIFICATION STUDY

March Workshop

March 12, 2024

MAPC
METROPOLITAN AREA PLANNING COUNCIL

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Today's Agenda

12:00-12:15	Check-In & Overview of School Fleet Assessments
12:15-12:30	Presentation from Power Options
12:30-12:45	Fleet Assessment Experiences
12:45-1:00	Discussion and Q&A

Check-In

Rename yourself:

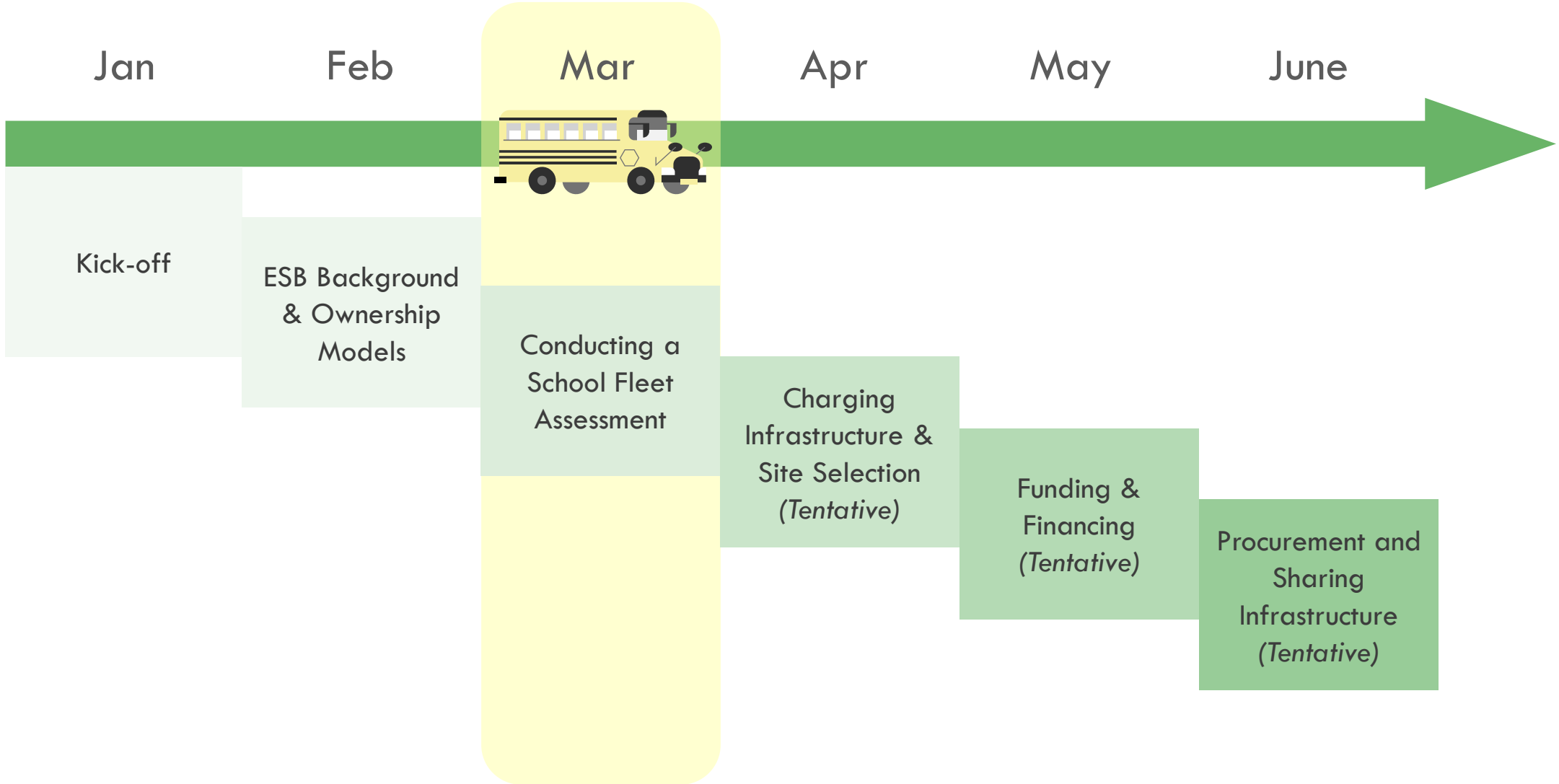
1. Name
2. School District/Municipality

Poll:

Is your school district considering conducting a fleet assessment?

- ❑We haven't yet thought about a fleet assessment
- ❑We will likely conduct a fleet assessment in the next 1-2 years
- ❑We are planning to conduct a fleet assessment within the next 6 months
- ❑We have already begun or completed a fleet assessment

Workshop Schedule



What is a School Fleet Assessment?

Technical planning support to develop a pathway to school fleet electrification, which typically includes some or all the following:

- Vehicle and charging infrastructure analysis
- Site feasibility studies and designs
- Cost and emissions analyses
- Preparing for and applying for future funding opportunities
- Vehicle and charging station procurement plans
- Stakeholder analysis
- Workforce considerations
- Educational materials
- Ongoing assistance and technical support

Sources: MassCEC ACT School Bus Advisory Services Program, National Grid Fleet Advisory Services Program, Eversource Fleet Assessment and Guidance for Public Fleets, Clean Bus Planning Awards Program

School Fleet Assessment Resources in MA

MassCEC ACT School Bus Advisory Services Program

- Free fleet electrification planning support from team of consultants (VEIC, PowerOptions, Energetics)

MASSACHUSETTS CLEAN ENERGY CENTER®

Utilities:

National Grid and Eversource

- No-cost Fleet Advisory Services for publicly owned fleets
- Many slots still available; preference may be given to fleets that serve Environmental Justice Communities

nationalgrid EVERSOURCE

Sources: MassCEC ACT School Bus Advisory Services Program, National Grid Fleet Advisory Services Program, Eversource Fleet Assessment and Guidance for Public Fleets

Other School Fleet Assessment Resources

Joint Office of Energy and Transportation Clean Bus Planning Awards (CPBA) Program

- Provides free technical assistance to school bus fleets to develop comprehensive and customized fleet electrification transition plans
- Awards accepted on a rolling basis until September 30, 2024.

EV Fleet Tools

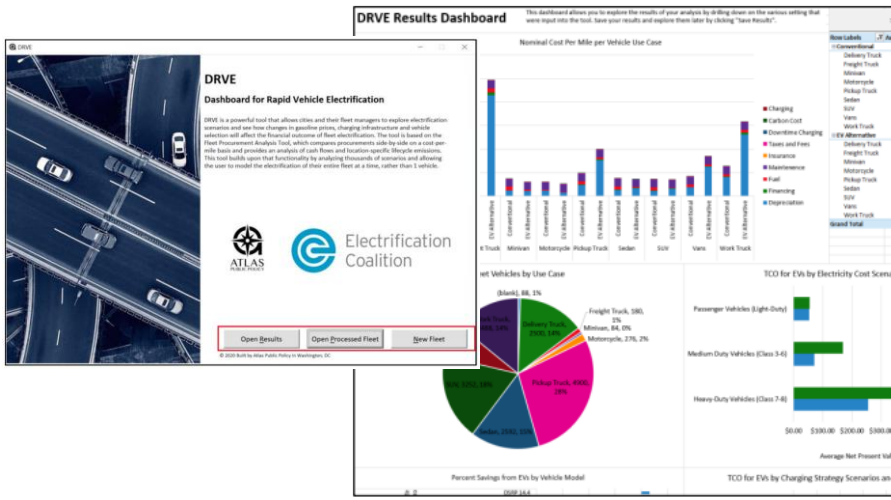
- "DIY" tools to guide municipal staff through planning for fleet electrification
- Includes the Municipal Fleet Electrification Planning Tool and Municipal Facilities Assessment Tool

Electrification Coalition's Dashboard for Rapid Vehicle Electrification (DRVE) Tool

- "DIY" Excel-based tool
- Users input current fleet data and compare total cost of ownership and emissions to an electric fleet

Joint Office of Energy and Transportation

EV Fleet Tools



Sources: Clean Bus Planning Awards Program, EV Fleet Tools, DRVE Tool

Today's Discussion

- **School Fleet Assessment Process**

  Anna Brackenhofer, *PowerOptions*

- **Fleet Assessment Experience**

  Cian Fields and Alex Oster, *Boston Public Schools*

  Eric Simms, *Concord*

ACT School Bus Advisory Services Program

MAPC MEETING

MARCH 12, 2024

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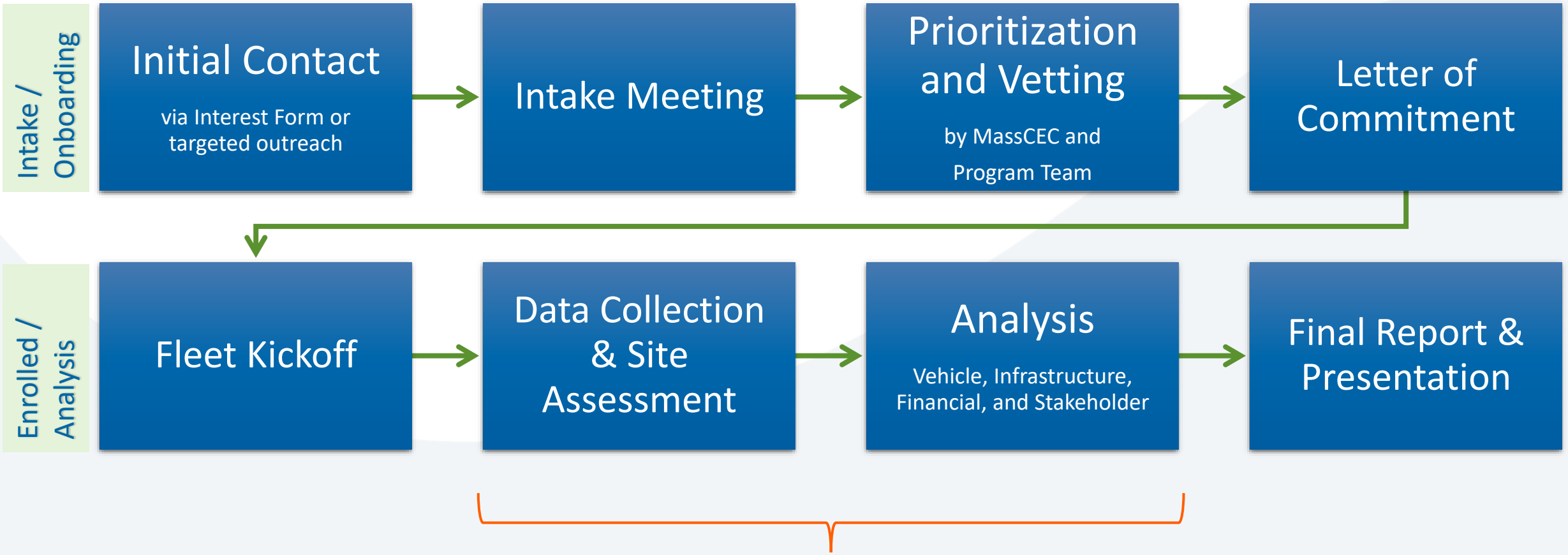
Advisory Services Program Overview

- **Goal**:
  - Provide school districts with a clear path to school bus electrification
- **Objectives**:
  - Reduce barriers to electrifying school bus fleets
  - Provide public school districts and third-party school bus fleet operators with technical assistance and a comprehensive fleet analysis outlining suitability for electrification
  - Aid fleets in pursuing federal and state funding opportunities to electrify their fleet
- **Team**:
  - Selected districts will work with MassCEC's lead consultant (VEIC) and partners (PowerOptions and Energetics) to compile the necessary information and data to conduct a fleet analysis.

PowerOptions veic energetics Clean Energy Consulting

Timeline


Intake / Onboarding
Initial Contact
via Interest Form or targeted outreach
Intake Meeting
Prioritization and Vetting
by MassCEC and Program Team
Letter of Commitment
Enrolled / Analysis
Fleet Kickoff
Data Collection & Site Assessment
Analysis
Vehicle, Infrastructure, Financial, and Stakeholder
Final Report & Presentation

Preliminary Needs Assessment

Preliminary Needs Assessment

- Data Collection Summary
  - Overview of school's fleet, including unique attributes, route details, extracurricular bus use, and operational details
  - Summary Table showing your fleet size, # of vehicles by type, passenger capacity, fuel type, average per mile fuel and maintenance costs by vehicle type, expected vehicle replacement age/mileage, and bus facility info

- Site Assessment Summary
  - Aerial map showing facility layout, proposed EVSE location, pathway to electrical interconnection
  - Location and type of electrical service and available site capacity, and a summary of upgrades necessary for full electrification.
  - Cost summary estimates for site upgrades, including labor, permits, and all equipment including chargers
  - Summary of any potential limitations or obstacles for fleet parking and proposed EVSE location, and other relevant site considerations
  - Utility support strategies

Data Collection & Route Analysis

Data Collection

- The program team works with each selected district (and third-party operator, if applicable) to gather existing fleet data
- Approach
  - **Data Collection Template** – Excel workbook that the fleet will complete and submit
  - **Meetings, Interview and Conversations** – organized and led by the program team to gather and confirm key info
  - **Site Assessment**
  - **Data Categories** include Vehicle, Travel, Utility, Incentive, Financial, and Stakeholder

Data Collection Template - Excerpts

Vehicle ID	17-Character Vehicle Identification Number (VIN)	Vehicle Model Year	Bus Make (Manufacturer)	Model	Passenger Capacity	Current Odometer (mi)	Fuel Type	Vehicle type (dropdown)	Own/Lease (dropdown)	Lease Provider (if applicable)	Expected Retirement Year, Age or Mileage	Overnight Parking Location	Year Vehicle Deployed into Service	Special purpose or function (Sports etc.)?	Estimated Annual Maint. Expense

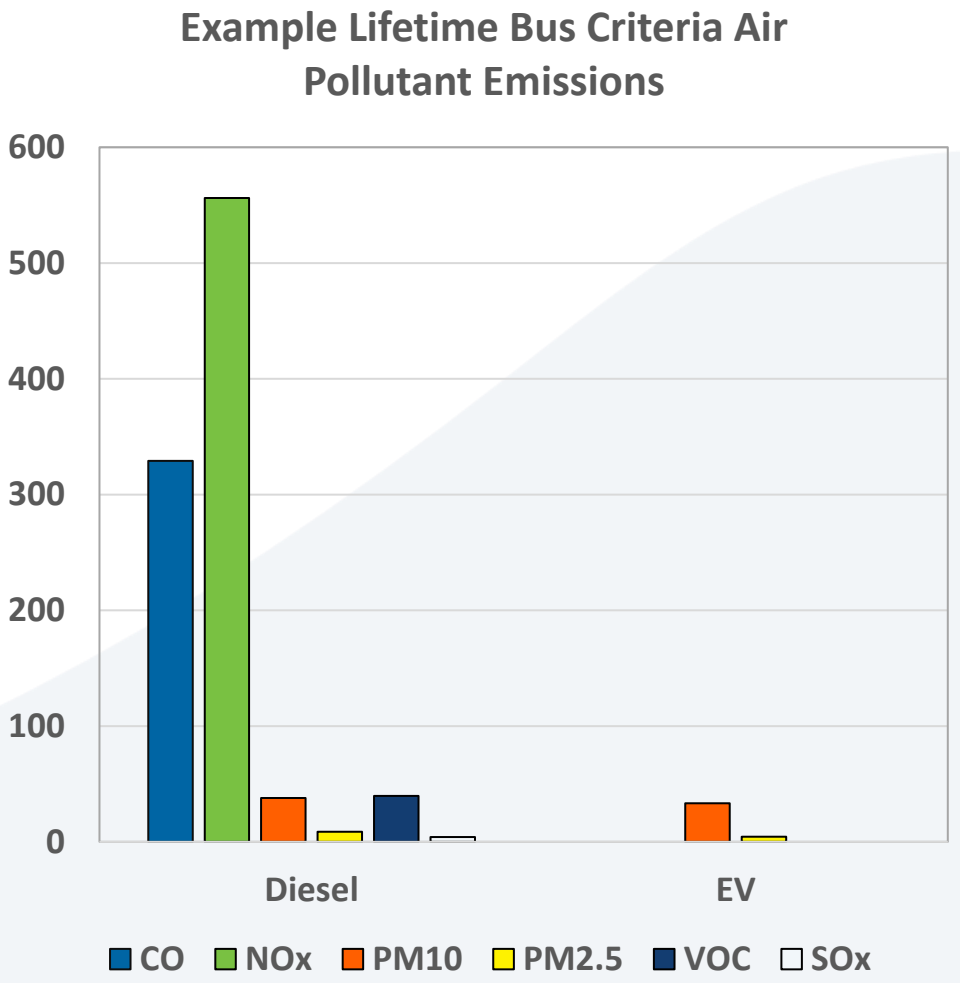
Vehicle Data

Route Name/ Number	Total trips per day and approximate timing of trips (e.g. 1 morning and 1 afternoon, 2 morning and 2 afternoon, etc.)	Typical Total AM Mileage (mi)	Typical Total PM Mileage (mi)	Typical AM Start Time	Typical AM End Time	Typical PM Start Time	Typical PM End Time	Bus type (A, C, D, or other) presently serving the route (dropdown)	Vehicle ID presently serving the route (if applicable)	Route map provided (Y/N)	Brief description of route, which includes information on whether there are paved or unpaved roads, maximum speed, hilly or flat terrain, and number of stops on the route. Feel free to provide additional relevant descriptions of the route.

Route Data

Emissions Reduction Analysis

- Amount and timing of Greenhouse Gas and Criteria Air Pollutant emissions reductions from electrifying each fleet based on the recommended Vehicle deployment scenario
- Represented by graphics, with tables included in appendix



Financial Analysis

- Total Cost of Ownership
  - Upfront and operational vehicle, charger, and charging infrastructure costs
    (Based on state or regional contract pricing where available)
  - Estimated fuel and maintenance cost savings
  - Impact of available incentives
  - Projections of per-vehicle and full fleet electrification costs and estimated residual values
  - Analysis of electric bill impacts
  - Market projections and insights
  - Savings can range from an estimated $4,000 to $11,000 per school bus every year (depending on labor costs, local electric utility rates and the price of petroleum fuels)

On-Site Assessment

Site Visit Discussion - Assumptions

- One to one bus to charging port ratio
- 100% fleet electrification
- Binary choice between Level 2 and DCFC chargers
  - There are many nuanced options – result of site visit and detailed analysis
- Buses stay where currently housed
  - May change depending on site visit
- Replace vehicles at end of natural lifespan
  - We will work with individual districts to adapt to purchasing needs
- Battery capacity degrades over bus lifetime

Case Study: School in Massachusetts

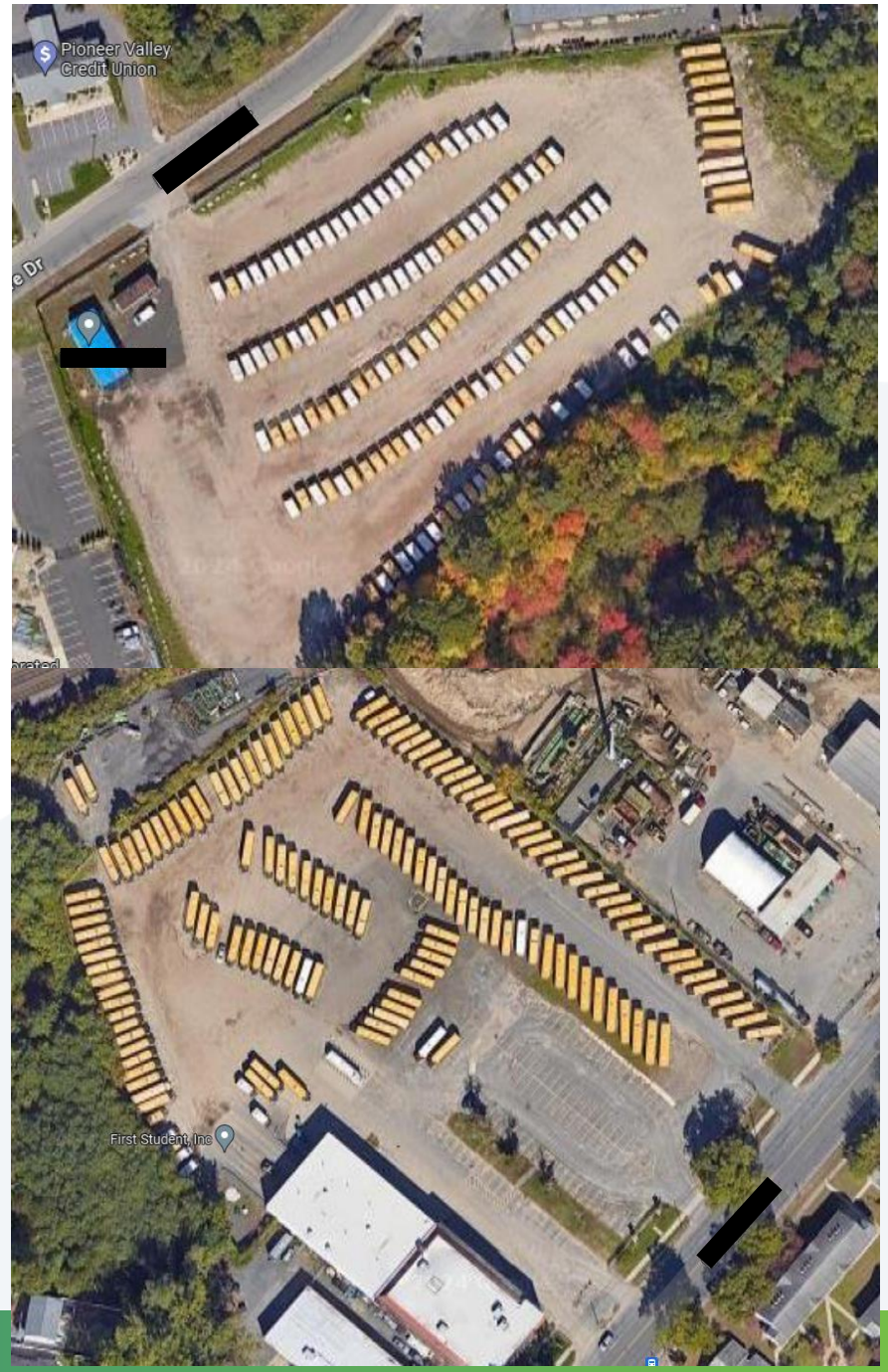
Case Study - Depots

Depot 1 (top)

- 145 buses
- All type A
- Mix of gasoline and diesel power

Depot 2 (bottom)

- 153 buses
- 143 type C
- 10 type D
- All diesel power



Case Study – Output Site Assessment

Depot 1 (top)

- 145 buses

Recommending 145 ports with the following split

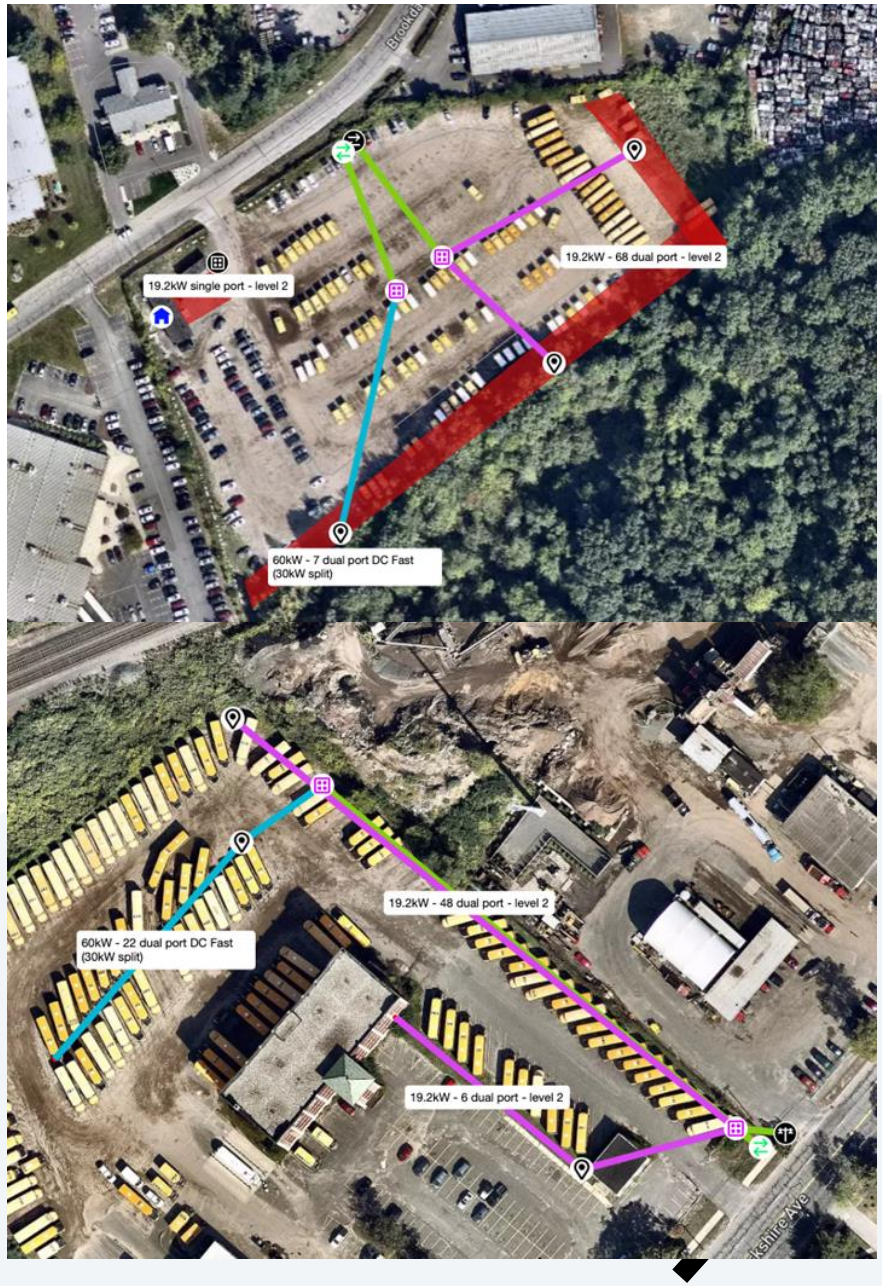
- 136 Level 2 19.2kW ports
- 14 DCFC ports, preferably 7 60kW units with 2 ports each

Depot 2 (bottom)

- 153 buses
- 143 type C

Recommending 153 ports with the following split

- 109 Level 2 19.2kW ports
- 44 DCFC ports, preferably 22 60kW units with 2 ports each



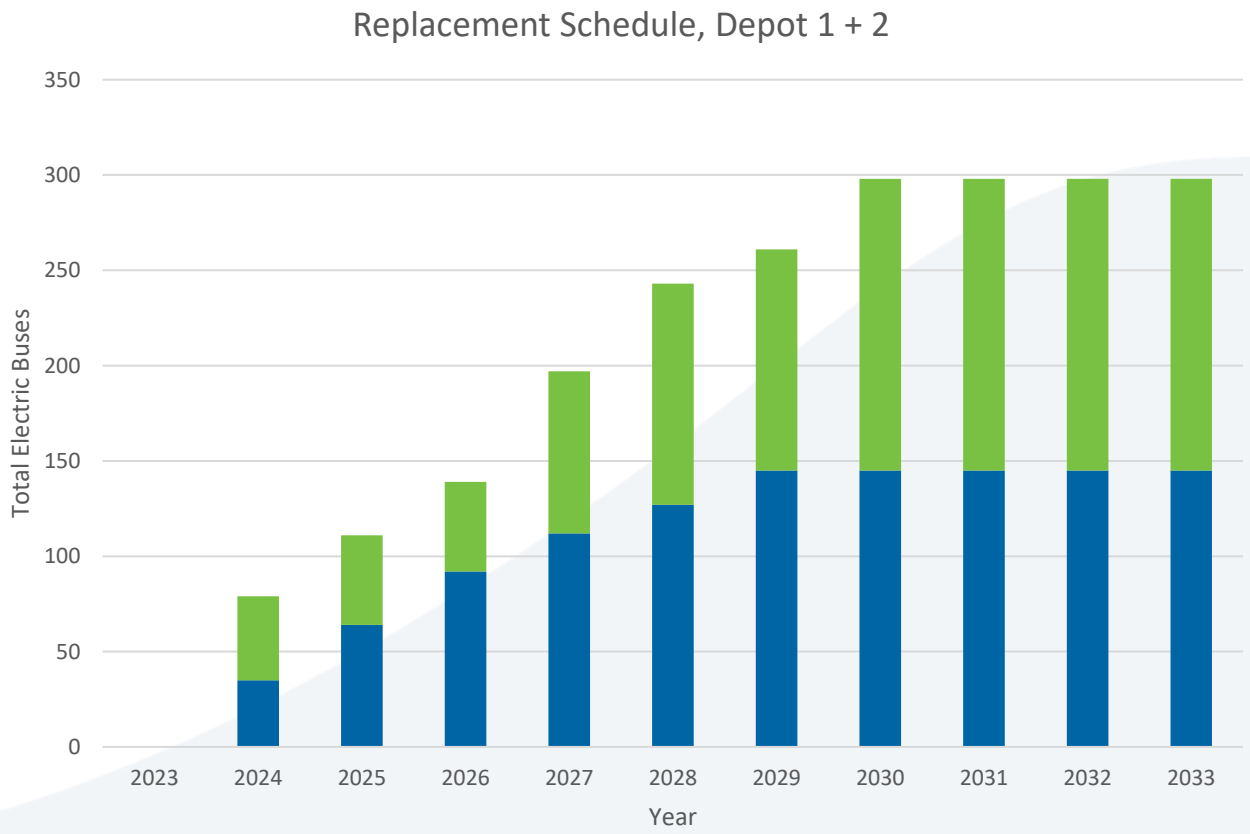
Existing Capacity and Costs

Scenarios –Location 1	Capacity (kW)	Total EVSE Installation Costs	Total EVSE Equipment Costs	# Level 2 stations /ports	# DCFC stations/ports
Max capacity existing utility service		$	$		
Max capacity existing electrical panel	19.2kW	$23,464	$8,123	1/1	0
Whole fleet electrification needs*	4,291kW	**$1,234,291**	$1,131,893	68/2	14/2

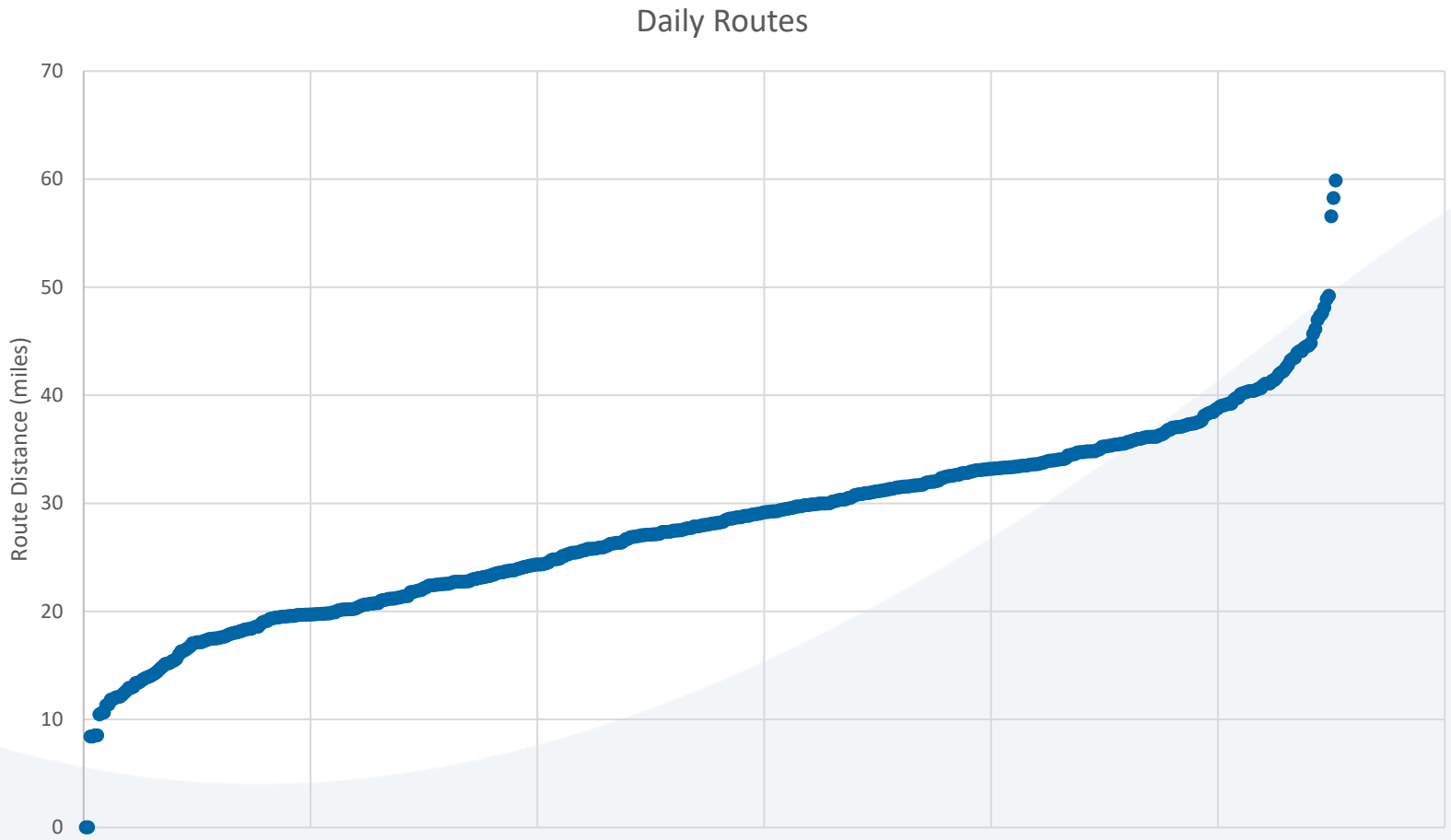
Scenarios – Location 2	Capacity (kW)	Total EVSE Installation Costs	Total EVSE Equipment Costs	# Level 2 stations /ports	# DCFC stations/ports
Max capacity existing utility service		$	$		
Max capacity existing electrical panel	19.2kW	$17,757	$7,703	1/1	0
Whole fleet electrification needs*	4,733kW	**$1,329,583**	$1,868,152	54.5/2	22/2

Case Study - Vehicles

- Buses at both depots have similar age distribution
- Age distribution skews slightly older
- Mostly 2013 to 2018 model years



Case Study - Routes



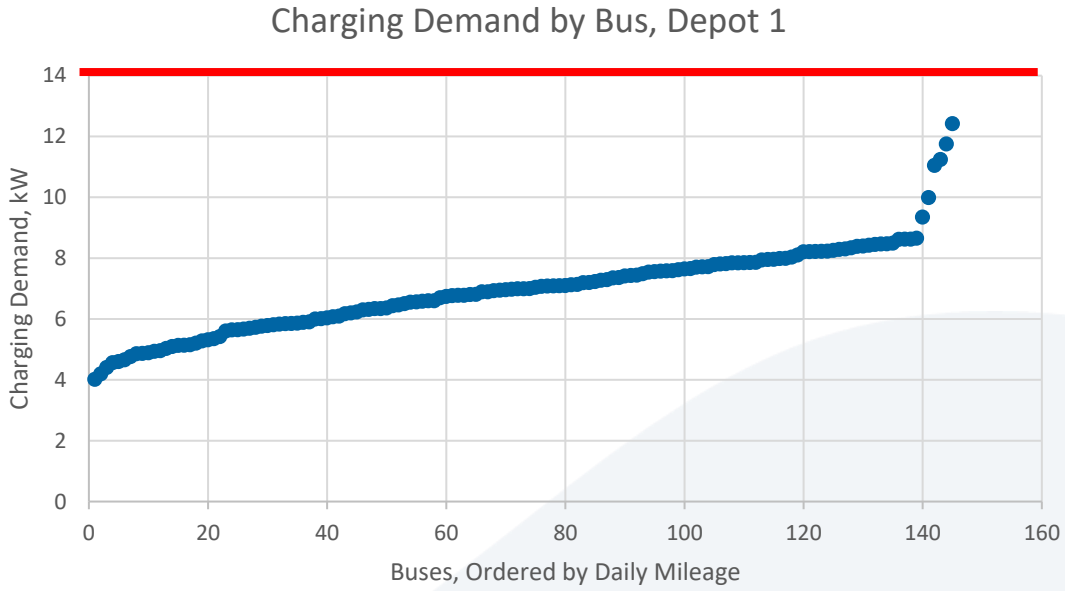
Case Study - Charging

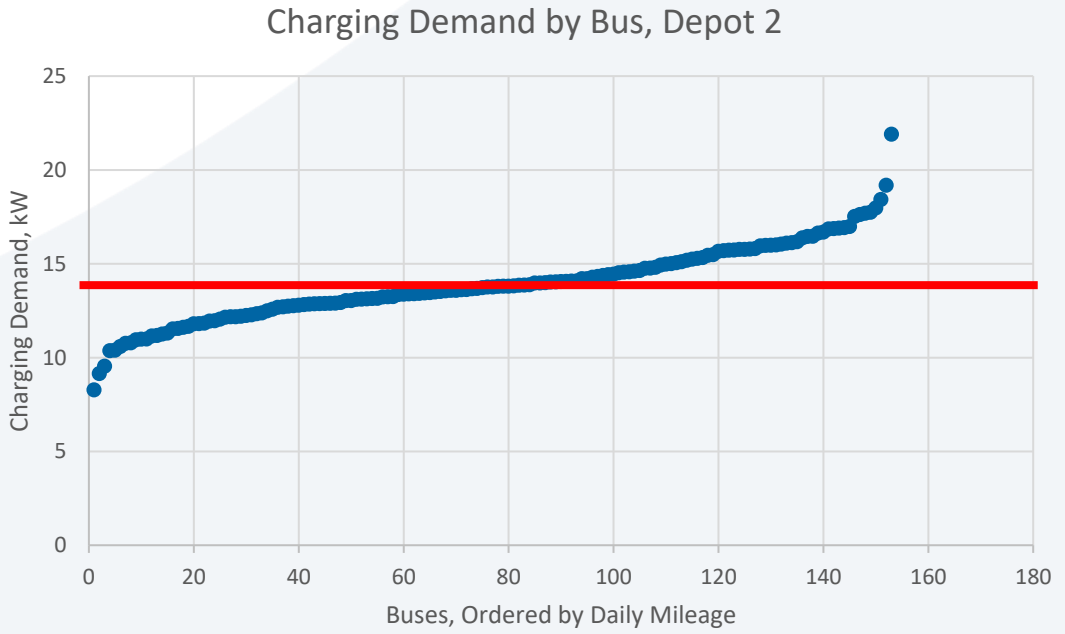
Depot 1

- 136 Level 2 ports
- 14 DCFC ports
- Type A buses are more efficient and serve shorter routes and fewer extracurriculars

Depot 2

- 109 Level 2 ports
- 44 DCFC ports
- Extra DCFC is for larger vehicles (C and D) as well as extracurricular trips





Electrification Approach

- **Plan <u>before</u> seeking funding**
  - Engage with stakeholders: fleet management, utility, and school board
  - School Bus Advisory Services Program
- **What costs will you need to consider for your project?**
  - Bus procurement
  - Charging equipment (EVSE) procurement
  - Installation of charging equipment
  - Utility upgrades
  - Consulting or project management
- **How to approach funding**
  - Vehicle, equipment, and installation cost
  - Multiple funding sources
    - Local match: engage with stakeholders
    - Combine funding
  - Remember operational savings over time

Funding

Federal funding

Program	What's covered?	How much?	Can it be combined?	Timing?
Federal Diesel Emissions Reduction Act (DERA)	Vehicle costs	Up to 35% of cost	State, tribal and local funds can be used as a cost share. Other federal funds, including VW funds, generally cannot	Applications due Dec 31, 2023
EPA Clean School Bus Rebate Program	Vehicle, charger and behind the meter infrastructure costs	Up to $345,000 for vehicle and charging infrastructure for zero-emission Class 7+ buses ($265,000 for Class 3-6) which meet one or more prioritization criteria – up to 25 buses	Yes, with EV Tax Credits. Not with other federal funding	Applications due Jan 31, 2024
Commercial Clean Vehicle Tax Credit	Vehicle costs	Up to $40,000 per vehicle (or 30% of incremental costs compared to gasoline or diesel, whichever is lower) for vehicles with a gross vehicle weight rating (GVWR) above 14,000 pounds	Yes	For purchases prior to Dec 31, 2032
Alternative Fuel Infrastructure Tax Credit	Charger costs	30% of eligible project costs, up to $100,000, for installations located in qualified areas	Yes	For purchases prior to Dec 31, 2032

Massachusetts funding

Program	What's covered?	How much?	Can it be combined?	Timing?
MOR-EV Trucks	Vehicle costs	Up to $90,000, per vehicle	Yes, with federally funded and administrated programs (not with MA funded/administered)	Open enrollment until funding exhausted
MassCEC ACTBus Deployment	Vehicle, charger and infrastructure costs	TBD	TBD	Re-opening Fall, 2023

Combining Incentives

Scenario: ABC School District purchases a zero-emission Class 7 electric school bus, and one (1) Level 2 EV charger. The District is prioritized under the EPA CSB program and located in a qualified area (per Alternative Fuel Infrastructure Tax Credit program guidance).

Source	Program	Eligible		Potential Funding
		Vehicle	Charger and/or Infrastructure	
Federal	EPA CSB Rebate	✓	✓	$345,000
Federal	Alternative Fuel Infrastructure Tax Credit		✓	$6,000[1]
Federal	Clean Commercial Vehicle Tax Credit	✓		$40,000
MA	MOR-EV Trucks	✓		$90,000
			Total Potential Funding	**$481,000**

1 – Assumes 30% of total charger and infrastructure cost of $20,000

Procurement and Ownership Models

Vehicle Procurement and Ownership Models

Model	Description	Benefits to the School District
Direct Purchase Model	The school district directly purchases electric school buses from manufacturers or authorized dealers and owns and operates the electric school buses.	☐ Cost-Efficient Operation ☐ Customization and Control ☐ Technology Management
Leasing Model	The school district leases electric school buses from a leasing company, often with a fixed-term lease agreement. The leasing company retains ownership of the electric school buses, while the school district is responsible for maintenance and operation.	☐ Financial Offloading ☐ Lease to Own Option ☐ In House Maintenance
Public-Private Partnership (PPP) Model (e.g. electrification-as-a-service model option)	The school district partners with a private entity, such as an energy company or a transportation service provider, to procure and operate electric school buses. The private entity may own and operate the buses, providing services through a contractual agreement.	☐ Financial Offloading ☐ Expertise and Support ☐ Outsourced Implementation, Operation, and Maintenance
Shared Ownership Model	Multiple school districts or educational consortia collaborate to jointly purchase electric school buses. Ownership and operation responsibilities are shared among the participating districts, promoting resource sharing and cost-efficiency.	☐ Shared Ownership and operation ☐ Resource sharing ☐ Cost-efficiency

Charger Procurement and Ownership Models

Model	Description	Benefits to the School District
School District-Owned Charger Model	The school district owns and maintains the chargers, providing a charging benefit to staff, teachers, and potentially students' families. Chargers are installed in school parking lots or designated areas with the help of certified electricians.	☐ Customization and control ☐ Technology management
Third-Party Owned and Operated Model	The entity (private or public) owns and maintains the charging stations and charges the school district a fee for their services. Chargers are installed on land leased or owned by third party.	☐ Financial offloading ☐ No in house maintenance
Subscription-based Charging Model (e.g. electrification-as-a-service model option)	School Districts subscribe to a charging service provider and pay a monthly fee for access to a network of charging stations. The charging infrastructure is owned and managed by the service provider, and users have access to the network based on their subscription.	☐ Pay for what you need ☐ Expertise and support
Collaborative Partnership Model	The school district partners with local businesses, government agencies, or community organizations to jointly fund and acquire EV chargers. Chargers are installed in school parking lots through a collaborative effort, with contributions from all partners.	☐ Shared ownership and maintenance ☐ Community access

Vehicle Analysis

- Potential vehicle replacement timelines
- Fossil fuel vs. electric operations and estimated cost savings
- Review annual routes and seasonality to determine charging needs
  - Description of worst-case battery range scenario
    - End of useful life of bus battery (80% range)
    - Coldest day of the year for that location
    - Discussion of other variables that can negatively affect range
  - Plot of route lengths to inform charging needs
    - Route is feasible with overnight charging only
    - Route will require mid-day charging
    - Description of any routes that are not feasible using today's technology if these exist
- Recommend one replacement scenario based on fleet input and professional expertise

Reminders & Next Steps

Next Meeting: April 9, 12-1pm

Topic (*Tentative*): Charging Infrastructure & Site Selection

Contact Alison (afelix@mapc.org) and Allie (ashepard@mapc.org) with any questions or to set up a 1:1 meeting

Fleet Assessment Resources

- MassCEC ACT School Bus Program
- National Grid Fleet Advisory Services
- Eversource Fleet Assessment
- Clean Bus Planning Awards
- EV Fleet Tools: Municipal Fleet Electrification Planning Tool, Municipal Facilities Assessment Tool
- DRVE Tool
- Electric School Bus Charging Station Planning Form
- Electric School Bus Facilities Assessment Guide - VEIC