

# METROWEST SCHOOL FLEET ELECTRIFICATION STUDY

*April Workshop*

*April 9, 2024*

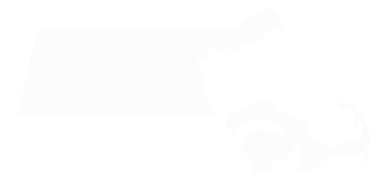
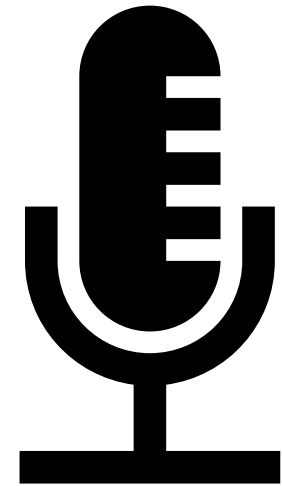


# Notification of Recording

*This meeting will be recorded, and the **Metropolitan Area Planning Council (MAPC)** may choose to retain and distribute the video, still images, audio, and/or the chat transcript.*

*By continuing with this virtual meeting, you are consenting to participating in a recorded event.*

*The recordings and chat transcript will be considered a public record. If you do not feel comfortable being recorded, please turn off your camera, mute your microphone, and/or leave the meeting.*



# METROWEST SCHOOL FLEET ELECTRIFICATION STUDY

*April Workshop*

*April 9, 2024*



# Today's Agenda

12:00-12:05 Welcome

12:05-12:15 All About Charging Infrastructure: WRI

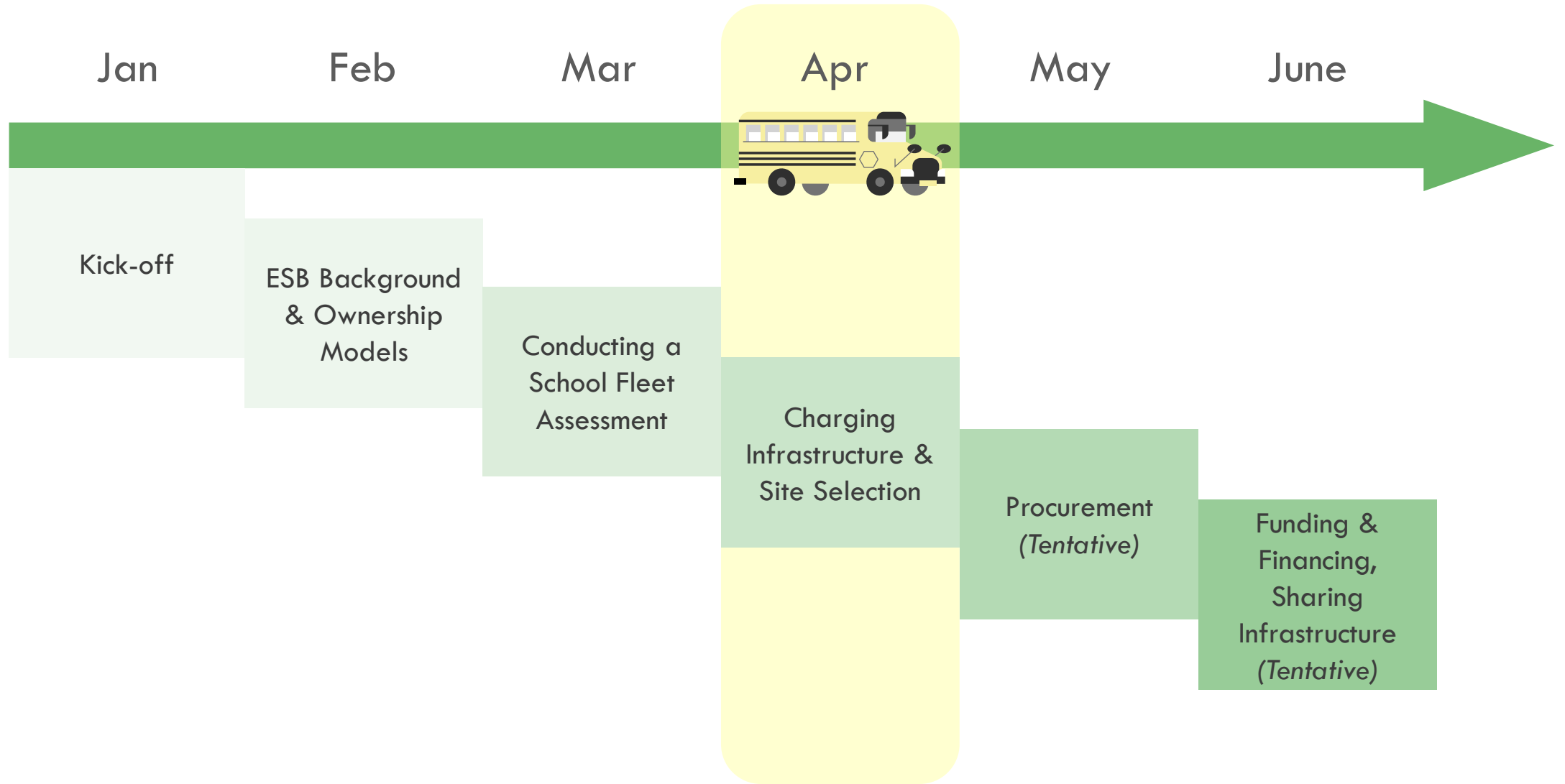
12:15-12:25 Working with Utilities: National Grid

12:25-12:45 On-the-Ground: Beacon Mobility, Highland Electric

12:45-1:00 Discussion and Q&A



# Workshop Schedule



A photograph of the interior of a school bus, showing several students sitting in rows of blue seats. The students are looking towards the front of the bus, and some are smiling. The lighting is bright, suggesting daytime.

**Electric  
School Bus**  
INITIATIVE

# WRI'S ELECTRIC SCHOOL BUS INITIATIVE

4/9/24 Metropolitan Area Planning Council Webinar -PANEL:  
April Workshop



# ABOUT WRI

WRI is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

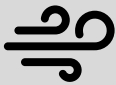


# WHY ELECTRIFY SCHOOL BUSES?

Electrification can accelerate decarbonization while bringing direct, tangible benefits to every community



**Improved health** and cognitive outcomes for children



**Cleaner air** than with diesel buses, especially in communities of color



**Reduced operating expenses** for school districts



**New jobs** in green manufacturing



A **tipping point** for MHD + electrification



Enhanced **resiliency** and **renewables integration** with V2G



# Electric School Bus Initiative Charging Infrastructure Resources

## Electric School Bus Initiative | Electric School Bus Initiative



### Power Planner for Electric School Bus Deployment

Nine Key Steps for School Districts

[esb-power-planner.pdf \(electricschoolbusinitiative.org\)](https://www.electricschoolbusinitiative.org/esb-power-planner.pdf)



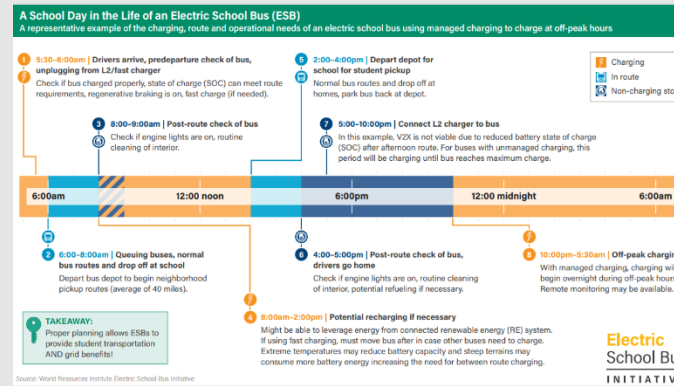
### Electric Vehicle (EV) Make-Ready Programs

Considerations for Utility Regulators for Electric School Buses and Beyond

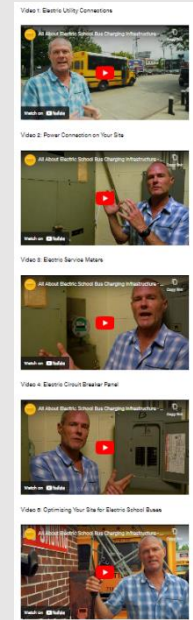
### Electric Vehicle Make-Ready Programs | Electric School Bus Initiative



### V2X Implementation Guide and Mutual Aid Agreement Template | Electric School Bus Initiative



### A School Day in the Life of an Electric School Bus | Electric School Bus Initiative



### All About Service Level Agreements (SLAs) for Electric School Buses and Chargers | Electric School Bus Initiative



### 8 Tips For Common Electric School Bus Charging Challenges | Electric School Bus Initiative

### All About Charging Infrastructure | Electric School Bus Initiative

# Thanks

**Greggory (“Gregg”) Kresge, PhD**

**Sr. Manager, Utility Engagement and Transportation Electrification – US Energy**

**Phone: +1 202-235-2010**

[Gregg.Kresge@wri.org](mailto:Gregg.Kresge@wri.org) | Twitter: @gregg\_kresge | LinkedIn: [www.linkedin.com/in/grkresge](http://www.linkedin.com/in/grkresge)

**electricschoolbusinitiative.org**

**facebook.com/ESBInitiative**

**twitter.com/ESBInitiative**

**linkedin.com/showcase/wri-electric-school-bus-initiative/**

# Electrifying School Buses in Massachusetts

*National Grid*  
*April 9, 2024*

**nationalgrid**





# Community Electrification: *Enabling equitable & affordable EV charging everywhere*


**>\$200M**  
MA EV Programs

### Multi-Unit Dwellings



*EV charging provides greater value to residents and improves property values*

### Public / Workplace




*Limited public charging is one of the biggest barriers to EV adoption*




**\$30M**  
Fleet Program

### Fleets



*One MHDV EV truck or bus can reduce >8x more CO<sub>2</sub> and >30x PM<sub>2.5</sub> than a passenger vehicle*

### Residential



*>80% of charging at home today, but barriers exist for >50% of drivers*

# Fleet Electrification: A Path to Cleaner Air, Equitable Access, & Future Load Insight

## Why Fleets?

- **MHDV ZEV Goals: 30% of new sales by 2030**
- **CO<sub>2</sub>: MHDV 8-30x CO<sub>2</sub> savings / vehicle<sup>1</sup>**
- **Health: MHDV 30-150x PM<sub>2.5</sub> savings / vehicle<sup>1</sup>**
- **Equity: Efficient path to support LMI / EJC communities**

## Key Customer Sub-segments



## Fleet Assessments (so far)

**275**

MA public fleets eligible for no-cost assessments

**>100**

MA fleets completed or in process

**>60%**

Vehicles with EV options available are TCO positive

**>\$270M**

Lifetime cost savings identified in 1<sup>st</sup> 88 fleets<sup>2</sup>

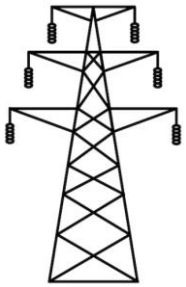
**>200**

Fleets investigating EVs in NY, including >170 schools<sup>3</sup>

# Why Partner With Your Utility On Your EV Electrification Journey



Incentive Programs – leverage utility EV programs and funding to help offset both capital costs and on-going operational costs



Collaborative Planning – understand capacity needs and requirements to help you “pick the right site”



Guidance and Support – provide assistance, support and help through your electrification journey



# Fleet Offerings

## Fleet EV Charging Program:

~\$30M  
for fleets



- Supports fleet electrification by providing utility and customer-side EV infrastructure rebates for private and publicly owned fleets
- Tiered charger rebates for eligible public fleets

## EV Off-Peak Charging Program:

\$0.03-\$0.05  
per kWh rebate

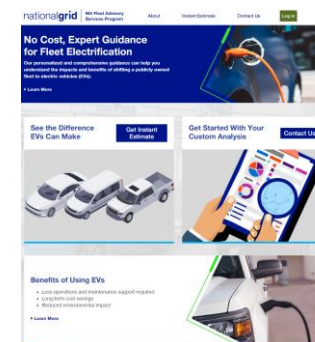


- Allows up to 1,000 fleet vehicles to earn rebates when they charge EV during off-peak times
- \$0.03/kWh in the winter / \$0.05/kWh in the summer

National Grid

## Fleet Advisory Services:

275  
studies



- No-cost, expert analysis to help 275 publicly-owned fleet customers in electrifying their fleet vehicles

## Demand Charge Alternative:

\$0  
demand charge  
in 1<sup>st</sup> year

Load Factor Threshold	Enrollment Years	Demand Charge Discount
None	1	100%
LF <= 5%	2 to 9	100%
5% < LF <= 10%	2 to 9	75%
10% < LF <= 15%	2 to 9	50%
LF > 15%	2 to 9	0%

$$\text{Load Factor} = \frac{\text{Billed Energy in kWh}}{\text{Billed Demand in kW} * \text{Hours in Billing Period}}$$

- 100% discount on demand charges in 1<sup>st</sup> year of operation
- Up to 100% discount for years 2-9, for load factors (i.e. EVSE utilization) below 15%

# School Bus Electrification: *Potential value of Vehicle-to-Grid (V2G)*

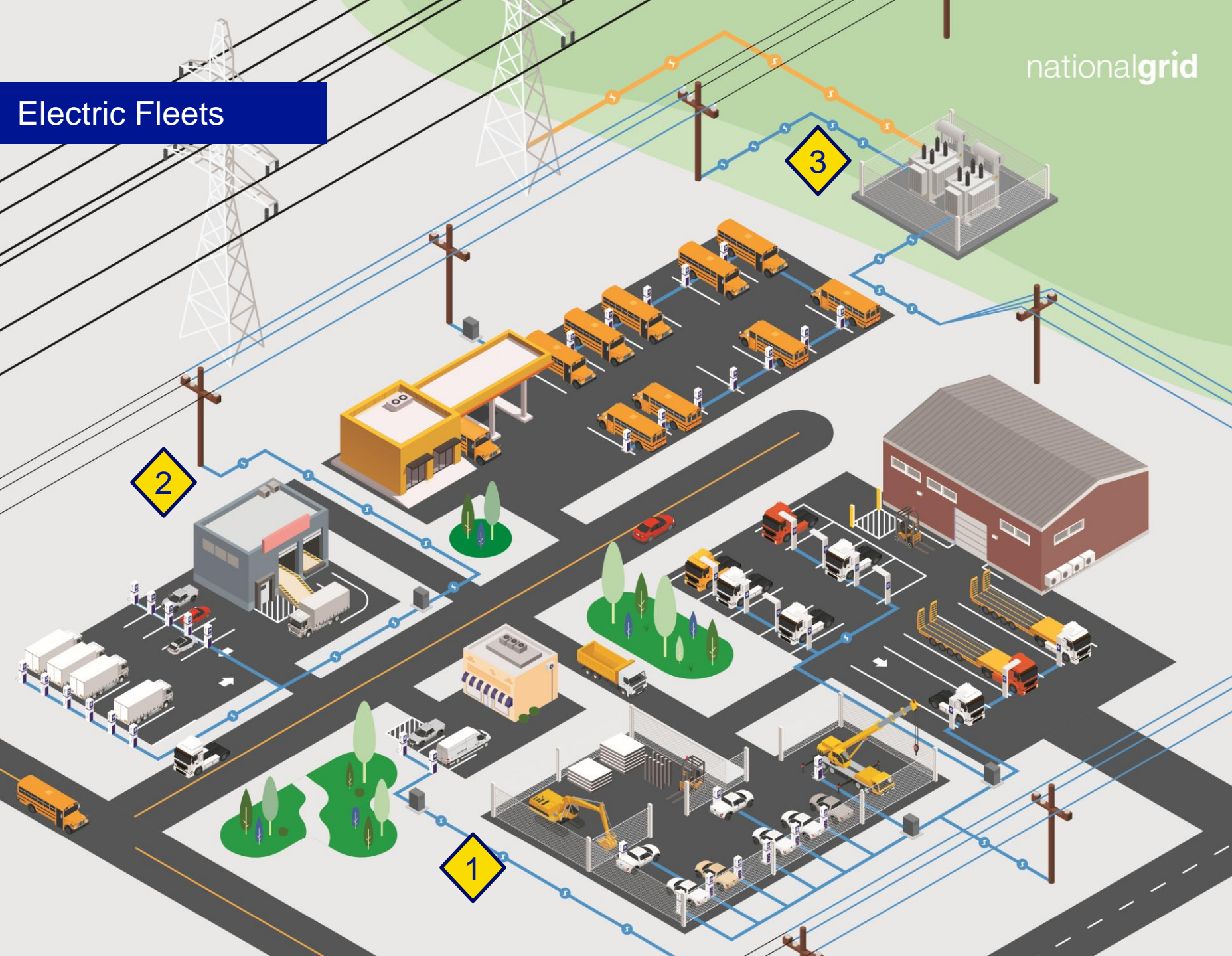
## The Connected Solutions program allows schools to monetize V2G:

- **Customers:** First EVs are participating via V2G (e-buses in Beverly, MA)
- **Value to the grid:** school buses provide ~3 MWh of energy per summer (enough for ~100 homes!)
- **Design:** Demand Response incentives up to \$200 per kW per summer. (Each V2G charger is 60kW → Up to \$12K/summer)
- **Implementation:**
  - National Grid provided “make-ready” support
  - Highland supports bus and charging, EnergyHub provides day-ahead notification before DR events
- **Next Steps:** Customers can initiate the process via the EV portal: [ngrid.com/ma-evcharging](https://www.ngrid.com/ma-evcharging)



*“We’re removing some of the worst [diesel] emissions from communities immediately, and National Grid helped us throughout the entire process.”*  
- Highland Electric





# Electric Fleets

nationalgrid

## Why Contact the Utility Early?

- 1 Fleet Clustering**  
Fleets tend to gather in certain areas, creating new electricity load centers
- 2 Magnified Impact**  
Fleets lead to massive power – potentially larger than today's C&I sites
- 3 Upgrade Timing**  
Grid upgrades require substantial lead-time, so 2027 requires planning now

# National Grid EV Programs: *Program Resources*

## Websites:

- EV Drivers Hub: [ngrid.com/evhub](https://ngrid.com/evhub)
- Fleet EV Hub: [ngrid.com/evfleethub](https://ngrid.com/evfleethub)

## MA Additional Resources:

- Commercial and Fleet EV Charging Program: [ngrid.com/ma-evcharging](https://ngrid.com/ma-evcharging)
- Fleet Advisory Services Program: <https://fleetadvisoryma.nationalgrid.com/>

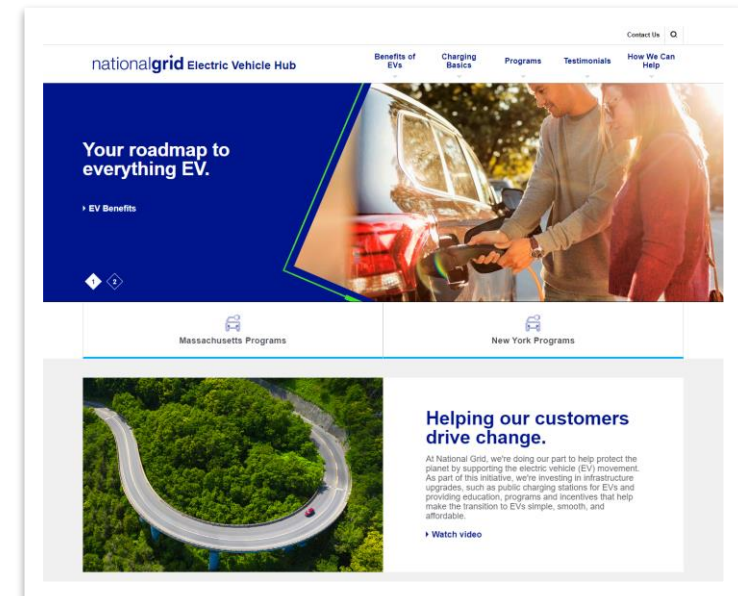
## Contact Us:

**Hugh Reece**, Fleet Program Manager

Email: [Hugh.Reece@nationalgrid.com](mailto:Hugh.Reece@nationalgrid.com)

**Ryan Wheeler**, Fleet Electrification Product Owner

Email: [Ryan.Wheeler@nationalgrid.com](mailto:Ryan.Wheeler@nationalgrid.com)



nationalgrid

# Fleet EV Charging Program

Charger Type	Customer Segment Eligibility	Utility-side Infrastructure Incentives	Customer-side Infrastructure Incentives	Charger Rebates**	Networking Rebates
Level 2 (L2)	Private Fleets	Up to 100%	Up to 100% (max \$5,700 per port/ \$6,700 if new service)	No Charger Rebate	Not Offered
	Public Fleets (non-EJC)			Up to 50% (cap per port up to \$1,800)	
	Public Fleets (EJC)*			Up to 100% in Income EJC Up to 75% in other EJC (cap per port up to \$3,600 Income/ \$2,700 other EJC)	
DCFC	Private Fleets	Up to 100%	Up to 100% (cap per port: <50 kW: Level 2 incentives above 50-149 kW: \$30,000 150+ kW: \$60,000)	No Charger Rebate	Not Offered
	Public Fleets (non-EJC)			Up to 50% (cap per port: <50 kW: Level 2 rebates above 50-149 kW: up to \$20,000 150+ kW: up to \$40,000)	
	Public Fleets (EJC)*			Up to 100% in Income EJC Up to 75% in other EJC (cap per port: <50 kW: Level 2 rebates above 50-149 kW: up to \$40,000 150+ kW: up to \$80,000)	

Public fleets are defined as: public transit, including school buses, and government owned fleets.

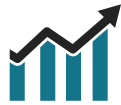
\* EJC eligibility is defined as fleet customers based in an EJC that meets any EJC criteria, including fleets that operate more than 50 percent of the time within census block groups that meet any EJC criteria.



\*\* DCFC charger rebate totals are capped at \$400,000 per site.

Installed chargers must comply with the MA ENERGY STAR requirements (L2) and be qualified by National Grid (L2 & DCFC).



# Customer Support: National Grid Fleet Electrification Details

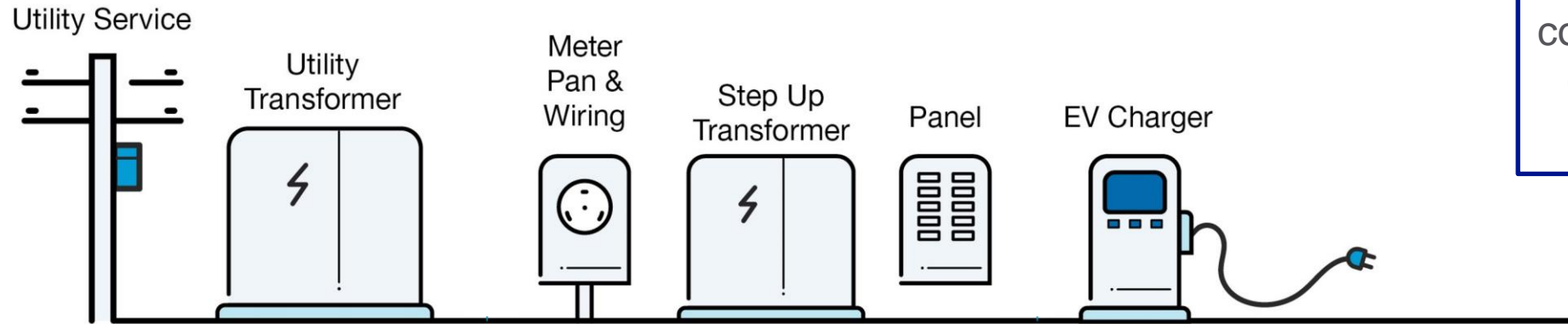


NAVIGATING THE UTILITY	PLANNING EV / EVSE ADOPTION	UTILITY INFRA.	CUSTOMER INFRA.	EV CHARGER (EVSE)	VEHICLE COSTS	OTHER SOFT COSTS	ONGOING OPERATIONS
Single Points of Contact (SPOC)	Fleet Assessment Services	Infrastructure Make-Ready Programs		EVSE Rebates	State and Federal Rebates available	Fleet Operator Responsible	Fleet Operator Responsible, Utility Advises, Reduces Fuel Cost, Enables Resiliency
 <p><b>MA</b></p> <ul style="list-style-type: none"> <li>Hugh Reece, Program Mgr.</li> </ul>	<ul style="list-style-type: none"> <li>275 Public Fleets eligible for no-cost assessments (Transit, School Buses, Govt.)</li> </ul>	<ul style="list-style-type: none"> <li>Up to 100% for L2 &amp; DCFC Charging</li> </ul>		<ul style="list-style-type: none"> <li>EJC: Up to 100%</li> <li>Non-EJC: Up to 50%</li> </ul>	<ul style="list-style-type: none"> <li>State and Federal Rebates available</li> </ul>	<ul style="list-style-type: none"> <li>Fleet Operator Responsible</li> </ul>	<ul style="list-style-type: none"> <li>Demand Charge Alternative</li> <li>Off-Peak Rebate</li> </ul>
 <p><b>NY</b></p> <ul style="list-style-type: none"> <li>Leslie Vishwanath, Program Mgr.</li> </ul>	<ul style="list-style-type: none"> <li>All fleets eligible for site feasibility assessments &amp; rate analysis</li> </ul>	<ul style="list-style-type: none"> <li>LDV: Up to 100% for L2 &amp; DCFC</li> <li>MHDV: Up to 90% for L2 &amp; DCFC</li> </ul>	<ul style="list-style-type: none"> <li>LDV: Up to 100% for L2 &amp; DCFC</li> <li>MHDV: Up to 50% for DAC &amp; public access sites</li> </ul>	<ul style="list-style-type: none"> <li>State and Federal Rebates available</li> </ul>	<ul style="list-style-type: none"> <li>State and Federal Rebates available</li> </ul>	<ul style="list-style-type: none"> <li>Fleet Operator Responsible</li> </ul>	<ul style="list-style-type: none"> <li>Demand Charge Rebate</li> </ul>

Key: ■ Primarily utility role ■ 3<sup>rd</sup> party options available ■ Customer primarily responsible ■ Customer & utility role

# Commercial Charging Infrastructure (Make-Ready) Summary

## What's Eligible?



Applies to all commercial customers (Public, Workplace, MUDs, Fleets)

Eligible for EV Charging Program Incentives			Not eligible	
<ul style="list-style-type: none"> <li>Customers may be required to pay for grid upgrades in excess of utility's design requirements</li> </ul>	<ul style="list-style-type: none"> <li>Panel</li> <li>Conduit</li> <li>Trenching</li> <li>Design</li> <li>Permitting</li> </ul>	<ul style="list-style-type: none"> <li>Step Up Transformers</li> <li>Wiring</li> <li>Customer Switchgear</li> </ul>	<ul style="list-style-type: none"> <li>Charging Station (public only)</li> <li>Networking (comm. &amp; MUD - public only)</li> </ul>	<ul style="list-style-type: none"> <li>Signage</li> <li>Maintenance</li> </ul>
	<p><b>Utility Constructs</b></p>		<p><b>Customer Constructs</b></p>	

# Demand Charge Alternative Program

The Demand Charge Alternative Program supports customers in reducing their operating costs of EV chargers by providing a tiered load factor-based discount on their demand charges.

The Demand Charge Program is approved and currently available for 10 years starting in 2023 with new enrollments accepted through 2032.

## Eligibility:

- All new and existing separately metered DCFC and L2 EVSE customers on General Service Demand Rates (G-2 or G-3)
- Eligible customers can enroll anytime during the first 9 years of the program

Website for more info: [ngrid.com/ma-evcharging](https://ngrid.com/ma-evcharging)

Load Factor Threshold	Enrollment Years	Demand Charge Discount
None	1	100%
LF <= 5%	2 to 9	100%
5% < LF <= 10%	2 to 9	75%
10% < LF <= 15%	2 to 9	50%
LF > 15%	2 to 9	0%

$$\text{Load Factor} = \frac{\text{Billed Energy in kWh}}{\text{Billed Demand in kW} * \text{Hours in Billing Period}}$$

## 2 x 150 kW Example:









- Rate Class: MA G-3
- Peak Demand: 300 kW
- 375 kWh per day
- 5.2% Load Factor (75% discount)
- Estimated monthly bill (years 2-9):

	No DCA	DCA
Customer charge	\$223	\$223
Supply Charge	\$1,300	\$1,300
Delivery Charge	\$600	\$600
Demand Charge	\$2,900	\$725
<b>Total</b>	<b>\$5,023</b>	<b>\$2,848</b>
<b>Effective kWh</b>	<b>\$0.44</b>	<b>\$0.25</b>

**~43%**  
cheaper electricity  
in years 2-9<sup>1</sup>

Note: 1) Year 1 has a 100% demand charge discount, which leads to ~58% electricity savings. Bill estimate above is for illustrative and analysis purposes only. National Grid cannot forecast or predict actual bill impacts. This does not create a binding or enforceable agreement. These rates are subject to change and are estimates only.

# Massachusetts EV Programs: ~\$206M of support for all EV customer types

Customer	Budget <sup>1</sup>	Value <sup>2</sup>	 Plans	 Infra.	 EVSE	 O&M
<b>Residential</b> 	~\$26M	<ul style="list-style-type: none"> <li>• 240V service upgrades for ~18k households</li> <li>• Turnkey install &amp; charger rebates for ~2k EJC households</li> <li>• Off-peak charging rebates of \$0.03-\$0.05 / kWh</li> </ul>		✓	✓	✓
<b>Multi-Unit Dwellings</b> 	~\$38M	<ul style="list-style-type: none"> <li>• No-Cost EV Ready site plans for ~200 sites</li> <li>• Infrastructure and EVSE incentives for ~550 sites</li> <li>• Demand Charge Alt. can save 20% to up to 70% on electricity</li> </ul>	✓	✓	✓	✓
<b>Public / Workplace</b> 	~\$95M	<ul style="list-style-type: none"> <li>• Infrastructure and EVSE incentives for &gt;7k ports</li> <li>• Co-Located Energy Storage for ~5 DCFC projects</li> <li>• Demand Charge Alt. can save 20% to up to 70% on electricity</li> </ul>		✓	✓	✓
<b>Fleets</b> 	~\$30M	<ul style="list-style-type: none"> <li>• No-Cost Fleet Advisory Services for ~275 public fleets</li> <li>• Infrastructure and EVSE incentives for &gt;600 ports</li> <li>• Demand Charge Alt. can save 20% to up to 70% on electricity</li> <li>• Off-peak charging rebates of \$0.03-\$0.05 / kWh</li> </ul>	✓	✓	✓	✓

Note: 1) \$206M total program budget includes administration; 2) Summary information only – see following pages or the program website for additional details and eligibility: [ngrid.com/ma-evcharging](https://ngrid.com/ma-evcharging)





# Highland

MAPC  
April 2024




# Example: Beverly Public Schools





# Site Assessment Considerations

1. Power Availability
2. Equipment Location
-  3. Impact to Operations



# Power Availability

## New Service v. Existing Service

- Existing service can usually handle 2-3 Level 2 chargers, may be useful for a pilot.
- New dedicated service likely needed for a deployment of more than 2-3 vehicles.



## Distance from Power Lines

- Large distance increases construction costs.



## Utility Engagement

- Useful to have a near-term goal versus long-term goal for planning purposes.
- There are ways to cost-effectively future proof a site without requesting a large service from the utility upfront.



# Power Availability



# Equipment Location

Consider space required for transformer, switchgear and chargers

- Transformer and switchgear each require at least a 6x6 concrete pad.
- Chargers typically require 3-5 feet of space.



Grass versus pavement construction

- Digging on grass or gravel as much as possible will reduce construction costs.



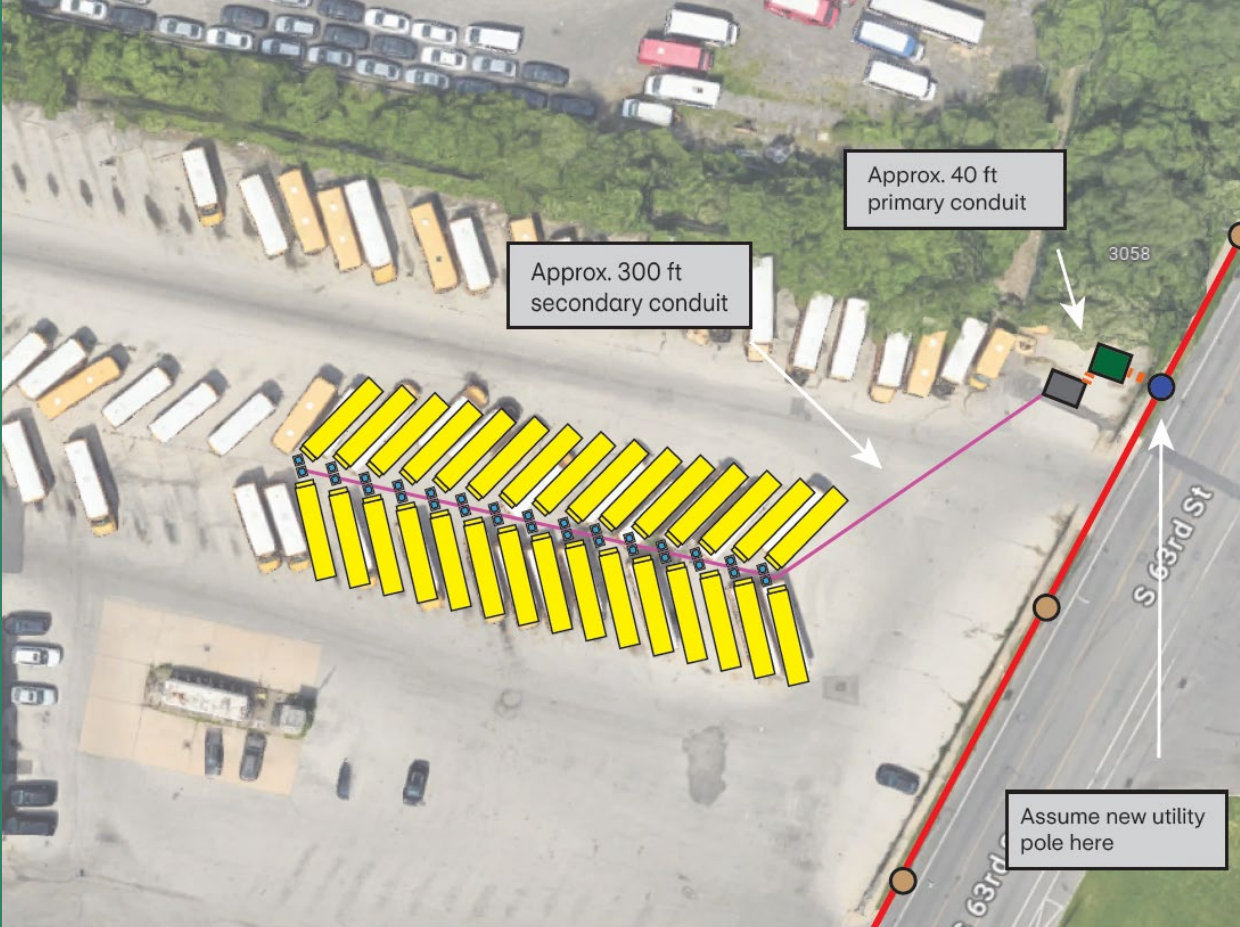
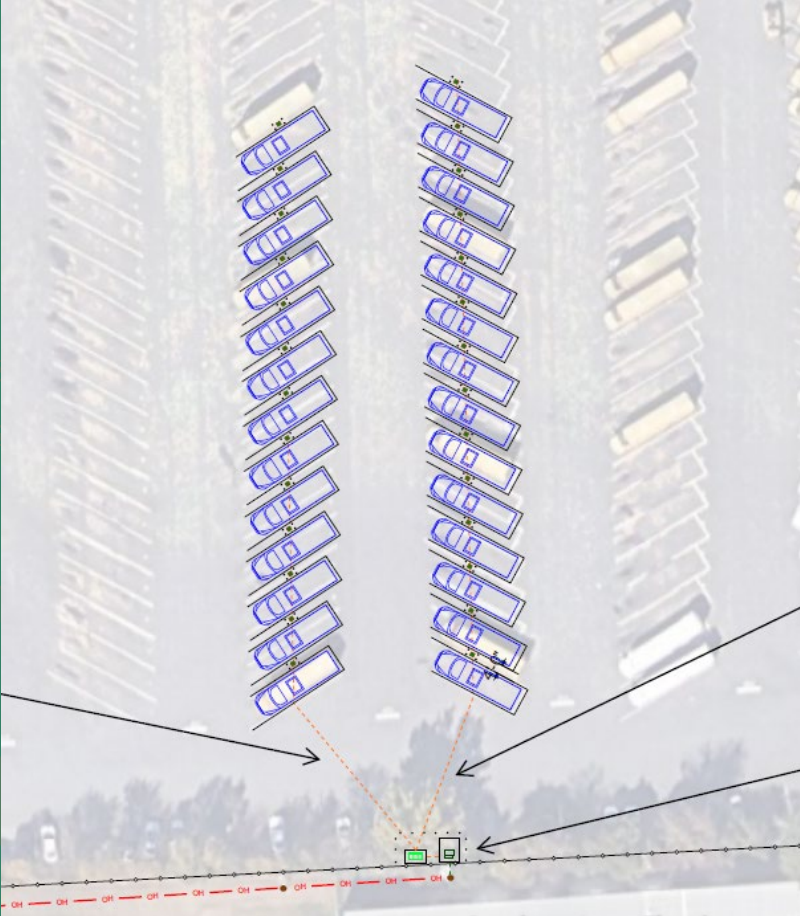
Consider optimal charger layout

- Single row
- Double row
- Islands





# Equipment Location



# Impact to Operations

## Traffic flow

- Fixed infrastructure may impact traffic flow

## Charge port location on vehicle

- Charge ports can be located towards the front or back of the vehicle. It is important to specify desired location when procuring vehicles, as it usually impacts the cost of the vehicle.





# Reminders & Next Steps



Next Meeting: May 14, 12-1pm

Tentative Topic: Procurement



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

# Charging Infrastructure & Site Selection Resources

---

## **Working with your Utility**

[All About Working with Your Electric Utility \(WRI\)](#)

[Working with your Utility to Electrify your School Bus Fleet \(WRI/VEIC\)](#)

[Coordinating with Electric Utility Partners \(EPA\)](#)

[Power Planner for Electric School Bus Deployment \(WRI\)](#)

---

## **Facility/Site Planning**

[Electric School Bus Facility Assessment Guide \(WRI/VEIC\)](#)

[Electric School Bus Storage and Charger Site Planning \(NYSERDA\)](#)

---

## **Charging Infrastructure, Installation, and Interconnection**

[All About Charging Infrastructure \(WRI\)](#)

[Determining Charging Needs and Selecting a Charger \(Clean Cities\)](#)

[Electric School Bus Charging 101 \(WRI\)](#)

[Installation Considerations \(Clean Cities\)](#)

[Interconnection Challenges and Solutions \(Clean Cities\)](#)

---

## **V2G**

[V2G Overview, Barriers, Opportunities \(Clean Cities\)](#)

[3 Design Considerations for Electric School Bus Vehicle-to-Grid Programs \(WRI\)](#)

---



# Upcoming Webinar Series

The Joint Office is partnering with the EPA Clean School Bus Program to host a technical assistance webinar series on topics relevant to the clean school bus community. All webinars will take place on Wednesdays at 1 pm. Topics include:

**March 27** - How to Develop a Training Plan and Where to Get Certified Training

**April 24** – Charging Best Practices, Incorporating Charge Management, Solar, Battery Storage, and Vehicle-to-Grid

**May 22** – Equipment Overview, Future Proofing, EVSE RFPs, and Best Practices

**June 26** – Differences Between ESBs and Internal Combustion Engine Buses, ESB Maintenance, and Bus RFP Best Practices

**July 24** - Battery Overview, Recycling/End-of-Life Options, and Warranties

**Aug. 28** - Building a Case for ESBs in Your Fleet Including Benefits, Total Cost of Ownership, and Emissions Calculators

**Sept. 25** – Electrification Process Including a Step-by-Step Guide for New Adopters

[Register for the EPA webinar series](#)

